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Correspondence.—Wishing to make this Journal a gazette of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, correspondence is solicited for publication from all who make the study of these subjects a pleasure or a profession.

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[OFFICIAL NOTICE.]

Western Gas Association.

OFFICE OF SECRETARY WESTERN GAS ASSOCIATION,
ST. LOUIS, MO., March 25, 1881.

The Fourth Annual Meeting of the Western Gas Association will be held in St. Louis, Mo., on Wednesday, May 11th, 1881, at 10 A.M., and continue three days. Due notice of the place of meeting will be given.

LEE A. HALL,
Secretary.

IMPROVEMENTS IN FURNACES FOR HEATING BENCHES.

There is probably no one subject of more interest or importance at the present moment than the subject of heating benches. Our columns for the past two years have borne witness of the constant thought, study and practical experiment devoted to this matter in this and in other countries. The proceedings of the last meeting of the New England Association added somewhat to the stock of information on this point, inasmuch as a paper by Mr. Nettleton brought out in the discussion two sides of the question, so far as one system of heating is concerned, viz., what some works had not done, and, also, what some works had done with it.

The history of unsuccessful attempts to arrive at certain results, by the use of any reasonable process, is always exceedingly instructive, and often much more so than the more glowing accounts which must naturally follow the successful attainment of the desired end. It is like a voyage at sea brought to a happy and prosperous termination; in the delight of reaching the desired haven, we may forget, or, at least, omit to state the many discomforts and disappointments arising temporarily from the head winds and rough weather which, though they may impede, do not entirely prevent progress. So it is with all successful endeavors at improvement. The motto that "all is well that ends well" is often availed of to bury many an unsuccessful effort that is ultimately followed by others that are crowned with success. For this reason the points brought out in the discussion alluded to were extremely valuable. In two works, one small and the other large, the same system was tried, and, for all practical purposes, failed from the same cause. In both cases the furnaces developed too much heat. Now, if one fault may be considered as better than another, it may certainly be said that a furnace developing too much heat has a "good fault," for all that can possibly be needed to overcome this fault is a knowledge of just how to manage the heats to arrive at results that are satisfactory. This, of course, will be found by a little experimenting, as was shown by those who are using the same system successfully.

One great barrier presents itself in opposition of every change in retort house management, and that is the positive belief, on the part of all the retort house labor, whether stoker, fireman or helper, "that the change is no good."

To the manager who is desirous of improving his workings and his methods, this is the first point to be overcome; it matters not whether the result is to benefit the men or not, they are, on principle, opposed to the change—simply, because it is a change—and here is the cause of the fruitlessness of many an effort; but it should never be allowed for one instant to interfere with the introduction of any improvement which has been shown to be practically successful in regular working.

The time is at hand when the summer repairs are to be made, benches rebuilt, etc., etc., and this is the time for every man to begin the introduction of such improvements as to him may seem best calculated to carbonize more coal with less expenditure of fuel. Fuel saved may not be of so much money value in this country as it is abroad; but it has a value, and the manager who knowingly throws away, or allows to be uselessly consumed, that which is of value, no matter how small, is simply recreant to the trust reposed in him to that extent. There are a dozen different systems of furnaces that may be tried. It is not for us to say which is the best, for each system may have a special value in special places; but what we would persistently urge is that the old, wasteful system of consuming 50, 60, or 70

per cent. of the coke made should be abandoned, and as fast as benches are renewed some more economical system should be introduced. It is what one saves that makes one rich—and because one cannot decide how to save the most possible, it is no reason why he should make no effort to save something.

Even a want of success, if attended with intelligent enquiry as to the cause, is far better than want of effort to improve. Try something, and, of course, try that which, upon the best obtainable information, seems most likely to give satisfactory results. Try that which seems best adapted for present needs, although future development may demand its entire abandonment.

Do something to be prepared to meet the demand that is growing louder and more earnest for cheaper and better gas, do it intelligently, and do not neglect the experience of others whenever it may be of service. The retort house of the near future must embody more common sense, more application of scientific principles, and less muscle, mere human force, and rule of thumb.

Electric Lighting in the City of London.

The London *Journal of Gas Lighting*, of April 5, contains the announcement of the fact that the long-promised display of the different systems of electric lighting for street illumination had commenced on Thursday, March 31st. The concern known as the Electric and Magnetic Company, controlling the Jablochkoff patents and system, dropped out at the last moment, and the district which had been assigned to them was re-allotted to the company working under the Lontin system. This change, of course, caused such delay that the streets which were to have been lighted by the Electric and Magnetic Company remain, for the time, in the peace, quietness, and perfection of light—the light afforded by the steady-going gas lamps.

The *Journal* awards the palm of superiority to the light furnished by the Anglo-American Company (the Brush system); but, with its usual candor and fairness, declares that it would be premature to pass judgment on the whole exhibition until an opportunity has been afforded of making a comparison also of the Lontin light, which, by this time, will probably have been placed in operation.

There are at the present time no less than five different systems of arc-lighting in operation in the city of London; and it would appear to an unprejudiced observer, situated on this side of the Atlantic, that the people of that city are pretty well supplied, at least as regards *quantity* and *diversity* of methods to choose from.

In concluding its remarks upon the subject, the *Journal* speaks the following—

"All that has been said above must be considered as the preliminary observations which any careful observer of the present exhibition would make before attempting to decide upon the import of the whole thing as illustrating a possible means of lighting the busiest thoroughfares of a great city, in substitution for gas. As our epigrammatic neighbors across the Channel have aptly put it, illumination is one thing, lighting is another. It has been decided in Paris that the electric light, as there shown, is illumination—splendid, dazzling it may be—but not lighting. Upon careful consideration of the necessities of foot and vehicular traffic through the cramped streets of this city, it must be granted by an impartial observer that the present experiment in the line of thoroughfares from Blackfriars to London Bridge affords further proof of the truth of the French saying. The quality of street lighting must be valued by the amount of light received in the darkest part of the road. The fairness of this principle can scarcely be called in question. This being granted, we are free to maintain that, as far as can be judged without precise measurement, the amount of light available on the footpath in Whitehall, between the new gas lamps recently erected by Mr. Sugg for The Gaslight and Coke Company, is equal, if it does not slightly exceed, the degree of illumination to be observed in a similar position with reference to either the Siemens or the Brush electric lamps in the City. Small and not particularly clear print of a type one size smaller than is ever used in the *Journal*, is readable in both cases, and therefore it may be conceded that such lighting is quite good enough for streets where, as in this country, people are not in the habit of sitting or standing to read the newspapers. But if gas and electric lighting are to be credited with equal power under these circumstances, further consideration of the method in which the power is in each case supplied points incontestably to the superiority of gas. It will not be denied that, for all purposes of vision, an area dimly but uniformly lighted is preferable to one dotted over with powerful lights, at such intervals that no part of the field illuminated is absolutely darker than the darkest of the former. So in a thoroughfare lighted in its darkest parts equally well by gas and electricity, the strain on the eyes of a passenger, caused in the latter case by constant changes between a glare of light and semi-darkness, is much more distressing than when, as at this time in Whitehall, the same wayfarer may walk from one end of the street to the other without being made painfully aware of the means by which his steps are lighted.

"From the point of view of omnibus drivers and others, who, while passing along a street at a quick pace, must, in our narrow streets, and from their elevated position, be continually exposed in an especial degree to the worst effects of electric street lighting, it is very easy to believe that the experiment in the City may not be hailed as an altogether unmixed blessing. But considerations of this kind can only be fairly weighed after a duly prolonged experience of the advantages and disadvantages of the new system. The experiment is now fairly launched, and must be allowed to go on to the appointed end.

"If we were so fond of prophesying as some of our electrician friends, we might be more fully disposed than we really are to indulge in anticipations of the end. We are more inclined to wait for results than to predict them, either upon the promptings of our hopes or fears. In any event, the termination of an experience in methods of street lighting, as we hope and believe, will not be an occasion for either undue exultation or despondency on the part of those who, while looking on street lighting as an important branch of business, yet draw the greater portion of their revenue from other sources."

Another View.

The other side of the same question was deemed of sufficient importance to merit the attention of another esteemed, but slightly enthusiastic contemporary, the London *Metropolitan*, who assures its readers that the "proceedings, so far as the City authorities were concerned, commenced at the Guildhall Tavern, where Sir Henry Tyler and Dr. Siemens were entertained at a dinner by the Commissioners of Sewers and the Bridge House Estates Committee of the Corporation, etc.," and a little further on asserts that there was only one toast proposed, which last, certainly, was very sensible. It does not appear, for a surety, that the *Metropolitan's* representative was present at the dinner, and was a silent and appreciative listener to the eloquent response given in answer to the "only toast"; but, certainly, something must have happened to him, for, after the "dinner" and "toast" had ended, and having arrived (together with the two sets of Commissioners before-mentioned, and the representatives of the electric light companies) upon the scene of action, he thus gives vent to the feelings which oppressed him:

"The firmament, as a contemporary very aptly puts it, seemed as if split in twain. There was a distinct upper and a distinct lower air. Down to the level of the great Siemens' lamp hung night's purple pall, bedecked with stars, and beneath was a nether sky lit up to brilliancy as by an artificial moon. As the distance increased the line of division assumed a different form, as if the houses, streets and people were under a brilliantly illuminated tent beyond and above which lay utter night."

It is to be presumed that it was the "distinct lower air" which circulated through this "tent," but the writer is not specific upon this point. The claim is made that "in penetrating power it" (the electric light) "leaves gas completely in the shade," and as a proof of this is mentioned the fact that it was "quite easy to read small type or even notes made in lead pencil, within twenty yards of each Siemens' lamp!"

That this was such astounding proof of the superior diffusiveness of the electric over gas light will be somewhat doubted, even by the *Metropolitan's* representative, should he station himself at a distance of thirty yards from one of the new lanterns illuminated with Sugg's or Bray's improved burners, and try the same experiment.

The writer concludes his remarks with the statement that "it is not too much to say that the steps taken by the Corporation in devoting so large an amount of funds to trials over such extensive areas for so long a period will be thoroughly appreciated and approved." Which last certainly goes to show that the ratepayers of London are very docile people, and disposed to "shake the hand that smites them," when they will be perfectly pleased with an arrangement which proposes to make them pay extravagant figures for what is, according to the showing of the electric light people themselves, unnecessary and wasteful illumination.

Sydney Gilchrist Thomas.

This gentleman, whose name is so well-known in connection with the basic process, is at the present time a visitor to this country.

It seldom falls to the lot of more than one man in a generation to accomplish the results which this gentleman has achieved at so early a period of life. Mr. Thomas has but just attained his 30th year, and the fame and fortune which he has acquired thus early is but the forecast of what promises to lead to still greater undertakings in the future.

Department of Public Works, City of New York.

EXTRACTS FROM REPORT FOR QUARTER ENDING DECEMBER 31ST., 1880, BUREAU LAMPS AND GAS.

[This report was published in the *City Record* April 11, 1881.]

DEPARTMENT OF PUBLIC WORKS,
BUREAU OF LAMPS AND GAS,
NEW YORK, January 10, 1881.

Hon. HUBERT O. THOMPSON, *Commissioner of Public Works:*

SIR—In compliance with the directions contained in your circular letter of 31st ultimo, I herein submit a report of the transactions of the Bureau of Lamps and Gas for the three months ending December 31, 1880, with a summary of the same for the entire year.

The following statement shows the number of new lamps fitted up, lamp-posts removed, reset, straightened, etc., by each company during the year:

By What Gas Co.	New Lamps Fitted up.	Lamp-posts Removed.	Lamp-posts Reset.	Lamp-posts Straightened.	Columns Refitted.	Columns Releaded.
New York	30	35	41	295	62	134
Manhattan	51	51	51	380	21	129
Metropolitan	140	38	61	324	14	61
N. Y. Mutual	1	5	11	78	3	11
Harlem	140	30	28	185	24	32
Central	42	30	30	63	2	6
Northern	.....	.....	.....	3	1	.....
Yonkers	16	.....	.....	.....	.....	.....
Totals	420	189	222	1328	127	373

The following table will show the number of new lamps lighted by the several companies during the year 1880:

New York Gas Light Company	30
Manhattan " "	58
Metropolitan " "	137
N. Y. Mutual " "	1
Harlem " "	138
Central " "	42
Yonkers " "	16
Total	422

The following statement shows the average number of lamps lighted under the supervision of the Department of Public Works in 1880:

New York Gas Light Company	3,560
Manhattan " "	6,804
Metropolitan " "	4,282
N. Y. Mutual " "	1,037
Harlem " "	4,682
Central " "	1,834
Northern " "	1,090
Yonkers " "	76
Total	23,365

The following comparative statement shows the total expenditures on account of the appropriations for lamps and gas, and the number of public lamps in use, for several years since 1860:

Year.	Total Expenditure.	Total No. Lamps.
1860	$431,355	14,630
1865	1,121,682	16,591
1870	1,355,710	18,198
1875	625,651	20,139
1880	494,658	23,511

The contracts for lighting the public lamps in the Twenty-third and Twenty-fourth Wards, which were made in 1870 by the town officers of Morrisania and West Farms, expired on the 31st of December last. In accordance with the proposals which were received on November 29, a contract has been made with the Central Gas Light Company for the lamps in the Twenty-third Ward (formerly town of Morrisania) for the four months ending April 30 next, at the rate of $10.75 for each lamp for the term. This is at the rate of $29.79 per year of 3,833½ hours; the price paid under the old contract being $45 per year of 3,833½ hours. A contract has also been made with the Northern Gas Light Company, for the lamps in that portion of the Twenty-fourth Ward which comprised the town of West Farms, for the same period, at the rate of $13 for each lamp for the term; which is at the rate of $36.02 per year of 3,833½ hours. The price paid under the old contract was $50 per year of 3,833½ hours. The term of four months was fixed in these contracts in order that they may expire at the same time as the contracts with all the other companies, and then, in April next, the entire city can be included in the proposals which will then be invited for the period of one year.

The following statement will show the prices now paid the several gas light companies, under the existing contracts, for supplying the gas to and lighting and extinguishing the public lamps for the year ending April 30, 1881:

New York	$15 00	per year.
Manhattan	15 00	"
Metropolitan	15 00	"
N. Y. Mutual	15 00	"
Harlem	17 00	"
Yonkers	30 00	"
Central	10 75	for 4 mos.
Northern	13 00	"

The following statement shows the prices named in the proposals which were received on December 8, for furnishing gas to such of the public buildings as are lighted by the Department of Public Works, for the year 1881, together with the prices paid for same service in 1880:

	1881. Per 1,000 Cu. Ft.	1880. Per 1,000 Cu. Ft.
New York	$1 75	$1 40
Manhattan	1 75	75
Municipal	1 80	2 25
Metropolitan	1 75	60
Harlem	2 25	1 25
N. Y. Mutual	....	2 25

No bids were received from either the N. Y. Mutual or Knickerbocker Gas Light Companies.

The prices charged by the several companies to private consumers are as follows:

New York	$2 25	per 1,000 cubic feet.
Manhattan	2 25	" "
Municipal	2 25	" "
N. Y. Mutual	2 25	" "
Metropolitan	2 25	" "
Harlem	2 25	" "
Knickerbocker	2 25	" "
Central	2 25	" "
Northern	3 00	" "
Yonkers	2 50	" "

Gas mains have been laid by the several gas light companies during the year as follows:

	Feet.		Miles.	Feet.
New York	2,100	Total miles laid to Dec. 31, 1880	113	1,837
Manhattan	4,317	" " "	174	2,379
Metropolitan	16,018	" " "	133	4,990
N. Y. Mutual	555	" " "	118	2,868
Municipal	3,809	" " "	76	452
Harlem	25,165	" " "	120	202
Knickerbocker	16,310	" " "	65	19
Central	4,435	" " "	43	2,481
Northern	....	" " "	24	4,950
Yonkers	....	" " "	4	1,161
Total miles laid in 1880	13 m. 4,069 ft.	Total laid in the city up to Dec. 31, 1880	874	219

The New York Company bought from Municipal Company .... 11,972 feet.
The Knickerbocker Company bought from Municipal Company 3,572 "
The Harlem Company has taken up ..... 3,403 "
The New York Company has taken up ..... 464 "
The total length of streets lighted is ..... 402 miles 1,255 feet.
" " piers " ..... 1 " 820 "
" " bridges " ..... 1 " 2,790 "
" area of parks " ..... 61 acres.

The following statement will show the amount of gas consumed in the public lamps and buildings of the city during the year 1880:

Twenty-three thousand three hundred and sixty-five lamps, burning 3 cubic feet per hour, consumed a total of 278,918,000 cubic feet. Add the amount consumed in the various departments and offices in which the business of the city is transacted, including the amount made on Blackwell's and Ward's Islands by Department of Public Charities for public buildings on said Islands, it is found that the total amount of gas used in 1880 for the purposes of the city foots up to the grand total of 321,583,860 cubic feet.

The gases of the several companies are of the following kinds:

New York Company, water gas, Tessié du Motay process.
Manhattan Company, coal gas.
N. Y. Mutual Company, from pine wood and naphtha.
Municipal Company, water gas, Tessié du Motay process.
Metropolitan Company, coal and naphtha.
Harlem Company, coal gas.
Knickerbocker Company, water gas, Tessié du Motay process.
Yonkers Company, water gas.
Central Company, coal gas.
Northern Company, coal gas.

The following table will show the composition of the several gases, as determined by Mr. Love the official Gas Examiner, from his analyses made during the year:

Constituents.	New York Company.	Manhattan Company.	Metropolitan Company.	N. Y. Mutual Company.	Municipal Company.	Harlem Company.
Hydrogen	27.14	45.79	35.41	10.57	26.25	46.53
Marsh gas	25.35	39.01	42.66	41.75	28.91	42.38
Carbonic oxide	26.84	6.31	9.17	9.53	27.12	3.14
Illuminants	14.63	6.38	7.41	15.41	15.80	6.31
Nitrogen	2.87	2.51	5.35	20.69	1.92	0.50
Carbonic acid	3.02	.....	.....	1.51	.....	1.08
Oxygen	0.15	.....	.....	0.54	.....	0.06
Sulphuretted hydrogen	.....	.....	.....	trace.	.....	trace.
	100.00	100.00	100.00	100.00	100.00	100.00

TESTING BURNER.

In Specification 2 of our former contracts it was provided that the gas should be tested by an Argand burner having 15 holes and a 7-inch chimney, and consuming at the rate of 5 cubic feet of gas per hour; and by this test the gas should have an illuminating power of not less than 16 candles. This is the old London standard burner, and while it is adapted for the testing of ordinary 16-candle gas, it is not a suitable or fair burner for testing the richer and higher specific gravity gases which are now supplied by the gas companies of this city. It was therefore deemed desirable that a burner should be selected for the regular daily testings which would be better adapted for the kind of gas to be tested, and which could readily be obtained by gas consumers. Specification 2 was therefore slightly changed for the present contracts by providing that the gas should have an illuminating power of not less than 16 candles when tested by the 15-hole Argand burner, and adding a clause that "the regular daily tests should be made with a burner that will obtain from the gas the greatest amount of light, and practicable for use by the consumer, and consuming at the rate of 5 cubic feet of gas per hour."

With the view, therefore, of selecting for testing purposes a burner best adapted for the kind of gas to be tested, and which was readily obtainable for general household illumination, Mr. Love, our Gas Examiner, procured burners of various descriptions and from different makers. With these burners frequent and careful tests were made of the gases of the several companies, and after due consideration the burners now used on the photometer were selected for the regular daily examinations.

The following shows the burners selected for the several gases, the illuminating power of the gas when tested by these burners, and the illuminating power of the same gas when tested by the old 15-hole Argand burner:

New York gas, by Bray's Slit Union No. 7, 22.28 candles. By old 15-hole Argand burner, 19.78 candles.

Manhattan gas, by Empire 5-foot burner, 19.70 candles. By old 15-hole Argand, 17.69 candles.

N. Y. Mutual gas, by Bray's Slit Union No. 7, 24.57 candles. By old 15-hole Argand, 19.06 candles.

Municipal gas, by Bray's Slit Union No. 7, 27.46 candles. By old 15-hole Argand, 21.32 candles.

Metropolitan gas, by Bray's Slit Union No. 6, 23.43 candles. By old 15-hole Argand, 19.08 candles.

Harlem gas, by Empire 5-foot burner, 19.18 candles. By old 15-hole Argand. 17.25 candles.

Yonkers Gas Company gas, by Bray's Slit Union No. 7, candles. By old 15-hole Argand, candles.

It will be seen by the above that while in coal gas there is a difference of about 2 candles between the new flat-flame burner and the old Argand, in the water and naphtha gases there is a difference of from 3 to 6 candles.

PHOTOMETER.

In June last alterations and improvements were made in the photometer at the Grand street station. This photometer, although a first-class one, was a single apparatus, designed for the testing of gas against the candle. It was deemed advisable to duplicate on the left hand or candle end the apparatus which is necessary on the gas burner end. A combined meter and clock, a governor, pressure gauge, standard for burner, with a micrometer cock and eccentric movement, and an automatic shut-off were therefore fitted on the candle end, so that now this photometer is one of the most complete instruments for testing purposes in this country. Being a double photometer, we not only test gas against the candle, but we can also test the gas of one company against the gas of another, and the larger gas burners, now being introduced, can also be tested.

ELECTRIC LIGHTS.—BROADWAY LIGHTS.

On February 24, 1879, a resolution was adopted by the Common Council of this city, requesting the Mayor, Comptroller, and Commissioner of Public Works (the Gas Commission) "to have experiments made to test the practicability of lighting the Central Park and the other public parks or places, streets, and avenues of this city with electric light, and with a view also of determining the relative cost of the two systems—viz., gas or electric light; such experiment to be without expense to the city."

As under this resolution no expense could be incurred by the city, no action could be taken in the matter, and consequently the subject was held in abeyance. On Nov. 6, 1880, a communication was received from the Brush Electric Light Company of New York, requesting permission "to erect ornamental lamp-posts, of iron, on Broadway, from Fourteenth street to Thirty-fourth street, for the purpose of lighting said thoroughfare by the Brush electric light; also, the necessary lamp-posts or poles in Twenty-fifth street, from its station to Broadway, for the wires for said purpose, all the work to be done, and lamps, wires, etc., maintained without expense to the city," and "the permission not to commit the city to any expense for said light." The length of said portion of Broadway is just one mile.

On the reception of this communication the resolution of the Common Council was taken up and considered, and, in accordance with its provisions, a resolution was adopted by the Gas Commission on Nov. 29, 1880, giving permission to the aforesaid Company, on its application of Nov. 6, 1880, to light Broadway, from Fourteenth street to Thirty-fourth street, by the electric light system of said Company; provided, however, "that all the work be done and the lamps, wires, etc., maintained by said Brush Electric Light Company at its own expense, and the Corporation of the city of New York be not committed to any expense for such lighting, and also provided that such permit shall be revocable by the Commissioner of Public Works at any time."

In pursuance of the permission above quoted, the Company has fitted a station at Nos. 133 and 135 West Twenty-fifth street, placed therein a 150-horse power Corlis engine, with the necessary dynamo machines, etc. It has also erected 21 cast iron lamp-posts, each 20 feet high, one having been placed at the intersection of each street crossing Broadway; also two cast iron shafts on the candelabras opposite Madison Park. The lamp-posts are cast in three sections, the lower section or base being 8 feet high, and on the two upper sections are projecting teeth or footholds to enable the workmen to climb the posts for the cleaning of the globes and replacing the carbon electrodes. The average distance between the lamps is 260 feet. The lamps have clear glass globes, and are suspended in a cast iron frame under an iron hood; on the top of this hood is a metal dome, which covers the two horns containing the rods or carbon holders. The iron work is of an ornamental design, but somewhat too heavy and massive, as they present too much obstruction to the light, and hence cause too great a shadow. The "voltaic arc," when formed, is about 1 foot above the top of the post, which brings the light 21 feet above the surface of the street. The lamps are of very simple construction, and contain no clock work or similar mechanism. The feeding of the positive carbon is entirely automatic, and is regulated by the electric current and the wire helices above the lamp, and after they are properly adjusted the lamps require no other attention than is necessary for the placing of the carbons in position. They contain two sets of ⅜ copper-coated carbons, each set of sufficient length to burn 8 hours; so that both sets will furnish a light for 16 hours, and a triple set for 24 hours. The positive carbon is 12 inches in length, and the lower or negative carbon is about 6 inches, these unequal lengths being used because the positive carbon burns away about twice as fast as the negative. There are two movable carbon rods or holders, one for each set. These are placed 3 inches apart, and both are actuated by the same magnet, in like manner as in the single lamp. The lighting mechanism connected with the magnet is so arranged that one of the rods is lifted slightly in advance of the other. When the electric current first passes through the lamp, both sets of carbons, having their members in contact, will divide the current between them; but as soon as the members of one set are separated by the action of

the magnet, the whole current is thrown through the other set without showing any spark between the carbons first separated. When the continued action of the magnet separates the other pair of carbons, the voltaic arc appears and the light is established. Now the clamp which was the last to raise its rod will be the first to release it when a forward movement of the carbons becomes necessary; hence the set of carbons which first came into play will burn until consumed, the other set remaining separated. But when the burning carbons are exhausted, any further effort of the magnet to feed them will at once bring the reserve set into contact, and the whole current will pass through this set, leaving the other carbons without current and permanently separated. The reserve carbons are then separated by the action at the magnet, and the voltaic arc is formed between the points; the transfer of the arc from one set of carbons to the other being instantaneous and scarcely perceptible.

The 15 lamps south of Twenty-sixth street were placed on one circuit, and connected with the station by No. 4 American gauge copper wire, insulated, and supplied with the electric current from a No. 7 dynamo machine, while the 8 lamps north of Twenty-sixth street were subsequently placed on the same circuit, and another No. 7 machine added. A number of commercial or private lamps in the Sturtevant and Gilsey Hotels, and other buildings, are on another circuit, and supplied with current from a No. 8 or forty light machine. The work of procuring and erecting the lamp-posts, mounting the lamps and stretching the wires, was done in a hurried manner, several of the lamps having been placed in position after dark on a cold winter's night. On the evening of December 20, just three weeks after the Company had received the necessary permission to do the work, the engine was started, and the generating machine instantly sent forth the electric current to the 15 lamps south of Twenty-sixth street, and in another instant 15 "voltaic arcs" sent out their brilliant light to what was previously a poorly lighted thoroughfare. The lamps north of Twenty-sixth street had not then been connected, in consequence of a lack of wire, but those were lighted on the night of January 15, and completed a full mile of electrical illumination. A time table was then furnished the Company for all night lighting. Since the engine was first started, private or commercial lights have been added, so that now there are 61 lights supplied with current from two No. 7 and one No. 8 machine.

The No. 7 machine will supply current for 16 lamps, requires 14-horse power, and makes 740 revolutions per minute. The No. 8 machine will light 40 lamps, requires 36-horse power, and makes 700 revolutions per minute. Its electro magnets are 18 inches deep, 16 inches long, and 11 inches thick. The armature is 24 inches diameter, and has 12 bobbins. The pulley is 20 inches diameter and 12 inches in width.

When the lamps were first lighted the change from gas light to the electric light was very great, the more so as Broadway is very inadequately supplied with gas light. It is 80 feet wide, and has but 3 lamps to the block, and these containing only 3-foot burners. To note the effect of the electric light alone, the gas lamps have been turned off on several occasions, but their light was not missed; and it was found that the 23 electric lights will replace about 110 gas lamps on Broadway and the side streets. An order will now be given the gas company to discontinue the lighting of the Broadway lamps for two or three weeks. The lamps south of Twenty-sixth have been in use just 28 nights—too short a time to permit of a positive opinion as to their permanency and entire reliability for street illumination. During this time three total extinguishments have taken place. The first of these occurred on the night of Dec. 26. This, it may be remembered, was the night of the very severe gale and driving snow storm. On going over the route on that evening for the purpose of noting the behavior of the lamps under a severe gale, it was found that the lamps were acting badly, the fluctuations or blinking were almost constant, and the arc frequently disappeared. These defects occurred whenever the stormy winds struck the lamps. On visiting the station, the lamp therein, which was on the same circuit as the Broadway lamps, was found to be acting in the same manner as those on the street, and I then suggested that the engine be stopped. On an examination being made, the cause of the trouble was readily ascertained. It was found that three of the lamps which had been mounted after dark were fitted on the posts in an imperfect manner; the iron supports were loose, and hence the winds caused these lamps to vibrate and bring the horns in contact with the iron cover, and when this occurred of course the current on the entire circuit was disturbed or broken. These defects, which may be ascribed to imperfect or hasty construction, were remedied on the following day. The second entire extinguishment took place at 6 o'clock on the night of the 30th, and this was occasioned by the slipping of a belt in the station, the lights being out about 15 minutes. The third extinguishment occurred at midnight of Jan. 6, and was caused by the breaking of a shaft containing the pulley, and was remedied by shifting the dynamo machine to another pulley.

With the above exceptions the lamps have performed their proper functions, and are burning in a brilliant manner. The lights are remarkable for their steadiness, and seem to be entirely free from the frequent blinking or fluctuations and the hissing noise so generally observed in arc lights.

Some disappointment has been expressed because the lights are not so large or intense as was expected. Of course, larger and intenser lights could be obtained by the use of larger carbons; these, however, would require greater power and necessarily increase the cost. The larger lights, which are used for exhibition purposes or large open spaces, usually contain ½-inch or ⅝ carbons, and these are not desirable for street illumination, as their great intensity would be offensive to the eyes, and besides they furnish much more light than is required. It is the desire of the Company to supply a light for public highways which may be considered suitable for the purpose; one not too large or dazzling, but yet large enough for efficient and practical illumination; and this is all that is necessary.

As the height of the lamp-post placed the lamps opposite the second story windows of several dwelling houses, it was thought at first that possibly the glare of the light might be offensive or annoying to the occupants of the dwellings, and in such case it was the intention to grind the part of the globe facing the house, or else place a screen behind the lamp. This, however, has been found unnecessary, as, on inquiry, it is learned that the lamps are in no way offensive.

The trials thus far made have demonstrated that the electric light can be made available for public illumination, and that it is now being advantageously used in various places. But for permanent street lighting the question of its positive reliability must be carefully considered. We must be sure that the light can be had during all the time it is required. All danger of failure must certainly be avoided, for no section of the city can be permitted to be in darkness during any time of the night. In erecting the circuits the wires must be so placed that they will be free from the risks which are liable to overground lines, and they must be located where they cannot be tampered with. Plant in the station must be held in reserve and ready for immediate use, for accidents to the best made machinery will unexpectedly occur. All these things must be provided for before the lights can be permanently adopted on streets as an illuminating agent, and the entire exclusion of gas.

That the streets of our city are inadequately lighted is a fact which must be apparent to every wayfarer. While a 3-foot gas burner may have been ample a half century ago, when our city was not much more than a town, it is quite evident that the light emitted from a burner of that capacity is insufficient for the convenience and comfort of a large commercial metropolis. Hence an improvement in our street lighting is very desirable, and this can readily and surely be accomplished by the substitution of larger burners. This, of course, would involve an increase in the cost of the gas, but it is hardly possible that the electric arc light can compete with gas at the rates now charged by the gas companies for the public lamps of this city.

All of which is respectfully submitted.

S. McCormick, Supt. Lamps and Gas.

Appended to this report is a very complete table showing the pressure on the public lamps of the several gas companies, as recorded in tenths of inches by the lamp pressure registers. It will be found on page 601 of the *City Record*, issue of April 11, 1881.

Loss in Mining Anthracite Coal.

Mr. P. W. Shaefer, a high authority, in discussing the wastefulness of the present methods of mining and marketing anthracite coal, draws an alarming picture of the state of affairs, when it is remembered that the extent of our anthracite deposits is very limited, and that in consequence of the constantly increasing difficulty of mining it, it must steadily increase in cost as exhaustion progresses. He estimates that not more than 66 per cent. of the coal is ever taken out of the mines. That which is brought to the surface is run through a huge structure from 80 to 100 feet high—very appropriately called a "breaker,"—ingeniously contrived for the destruction of coal. Of these there are no less than 300 in the anthracite region. To the top of these the coal is raised, and then descends through a succession of rolls and screens, emerging at the bottom in a series of assorted sizes, from huge blocks of lump coal to unmerchantable dust, which last forms a grievously large proportion of the whole. This process involves, according to Mr. Shaefer, a loss of good coal equal to 20 or 25 per cent. of the whole quantity mined. The coal wasted in mining, say 40 per cent., and in preparing, 25 per cent., brings up the total of loss to the alarming figure of 65 per cent.—*Manufacturer and Builder.*

Price of Gas in Paris.—The price of gas in Paris, to private consumers, is 30 centimes per cubic meter—equivalent to $1.75 per 1,000 cubic feet. The price to the Municipality is only 15 centimes per cubic meter, or about 87½ cents per 1,000 cubic feet.

[From the London "Journal of Gas Lighting."]

German Continental Gas Company.

TWENTY-SIXTH ANNUAL REPORT OF THE DIRECTORS.

We have received a copy of the Directors' Report and the statement of accounts of the past year's working of the German Continental Gas Company, of Dessau, presented at the twenty-sixth annual meeting of the Company, held on March 14. The present report commences by referring to the closing passages of the report for 1879, wherein a hope was expressed that an improvement might be experienced in the business of the Company, as well as in the general trade of the Continent. This hope has been realized during the past year, the gas consumption of the German stations of the Company, which had decreased during the two previous years, having again made some progress, completely reaching the normal increase of past years in the latter six months, although the average of the whole year was still somewhat behind. At the foreign stations, Warsaw, Krakau, and Lemberg, the increase was smaller in the first and larger in the second half year than in the preceding year, the average being, on the whole, a little lower. The increase in gas consumption was—

	German Stations. Per Cent.	Foreign Stations. Per Cent.	Total Per Cent.
In the first half of 1880	1.09	5.68	3.17
" second "	8.38	8.97	8.64
In the complete year 1880	+4.98	+7.42	+6.08
" " 1879	—2.93	+7.91	+1.67

The extraordinarily severe weather in December had a great influence on the increase of the second half year. In the first period considerable improvement took place in the rate of exchange on Russia, whereas the Dulcigno affair caused a considerable decrease in the second period, only giving place to a slight recovery toward the end of the year. The average realized was 211, as against 206 in 1879, thus showing a small improvement. It is hoped that the measures lately taken by the Ministry of Finance, and the maintenance of peace in the East, will soon result in an increased value for Russian currency. In other respects the past year gives little cause for comment. There is in reality no competition, as regards the Company, with the electric light and the competition of petroleum has diminished in intensity wherever the general state of business has become more favorable.

The gas-meter works have been much busier, and realized a profit of 23.83 per cent. on the sunk and working capital apportioned to this branch of the Company's operations, as against 14.18 per cent. in the year before, and 7.66 per cent. in 1878. Altogether 728 meters were made, or 360 more than in the previous year; 310 meters were altered to the metre scale and repaired, or 137 more than in the year before. Besides this, there was a very considerable increase in the manufacture of brass fittings, lighting apparatus, regulators, lanterns, etc.

There have been no accidents or interruptions in the working of any of the stations. No compensation has had to be charged to the fire and explosion insurance fund, the balance of which has risen to 101,172.96 marks. The appointment of a second engineer, vacant through the death of Herr W. Voss, has not been filled up in consequence of the great exertions of Herr O. Möhr, the Company's Chief Engineer.

By the resolution of the general meeting, held on the 12th of March last year, which was the twenty-fifth anniversary of the formation of the Company, the officers' pension fund was created, thereby completing the general insurance and pension fund for the under-officers and workmen, previously provided by the resolution of July 1, 1874. The sum of 50,000 marks granted by the general meeting forms the working capital of the pension fund, to which all officers in receipt of yearly salaries of less than 3,000 marks pay 2 per cent. of their incomes, while the Company contribute double this amount, and also allow interest at the rate of 5 per cent. on the whole capital. The details of the now completed organization for the pension and assistance of the Company's servants are to be found in the report of the progress of the Company during the first 25 years of their incorporation, published at the same time as this report.

In connection with the celebration of the twenty-fifth anniversary of the Company, the following extraordinary expenditure was made:

	Marks.
To the pension fund	50,000.00
To under-officers, workmen, widows and orphans	23,079.38
Total	73,079.38

To which are to be added the following yearly expenses of the same class:

	Marks.
Contribution to the officers' pension fund	6,011.18
Interest at 5 per cent	2,608.47
Pension to a manager (granted before the pension fund was formed)	1,800.00
Accident insurance, and pensions to under-officials and workmen, and their widows and orphans	9,544.44
Contributions by the Company to local sick funds	3,327.15
Total	23,291.24

Thus the extraordinary and ordinary payments on this account amounted together to 96,370.62 marks.

As mentioned in the last report, a new contract was concluded on Jan. 22 with the town of Ruhrort, on the basis already announced (that is, the town waiving the right of acquiring the works gratis, in consideration of a compensation to the community and a reduction in the price of gas). On the 8th to the 12th of October a contract was also concluded with Gladbach, the existing conditions being prolonged to the end of 1903.

The following is an analysis of the gas consumption:

		Cubic Metres.		Per Cent.
Street lighting		2,769,492	=	13.75
Public buildings		1,869,831	=	9.29
Private consumers		9,065,258	=	45.03
Manufactories		5,967,031	=	29.64
Gas for heating, etc.—				
Gas engines	193,557			
Cooking stoves, etc	266,238			
		459,795	=	2.28
Total		20,131,407		100.00

According to this statement the following classes of consumption show a decrease from the previous year: Street lighting by 0.33 per cent., public buildings by 0.08 per cent., and private consumption by 0.52 per cent. The following have increased: Manufactories by 0.55 per cent., and gas for heating, etc., by 0.38 per cent. In all classes, however, there has been a considerable absolute increase. The largest increase—161,216 cubic metres—is in the railway stations and workshops, partly due to the increased traffic, and partly to departure in many cases from the excessive and dangerous economy practiced by the railway officials during the previous year. The remaining increase is chiefly made up as follows: On the iron and steel industry, 74,648 cubic meters; on the cotton industry, 70,108 cubic meters; on mills and steam bakeries, 55,902 cubic meters; on the woolen industry, 47,248 cubic meters; silk factories, 37,139 cubic meters, and so on. There were large decreases in the leather trade consumption, of 15,277 cubic metres; in printing and paper works, of 13,662 cubic metres; in tobacco mills, of 13,466 cubic meters, and so forth.

The increased consumption of gas for motor engines (there being 116 gas engines of 240 horse power on the books), and for heating, cooking, and general trade purposes, amounted to 99,444 cubic meters. The increase of this class of consumption has not yet answered the Company's expectations, owing, it is surmised, to the innate conservatism of ladies and cooks, which militates against the introduction of new methods of doing the work of a household; still there is an actual increase of 28 per cent. to be recorded. The Company have endeavored, and with success, to introduce gas for locomotive engines. The real advantage, in respect of the economical working of gas-making establishments, of the sale of gas for heating, etc., appears in the example of Luckenwalde, where this class of consumption, though only 1.89 per cent. of the total quantity of gas sold for the whole year, was yet 30.27 per cent. of the total consumption in the months of June and July. It is clearly shown by this instance how much more advantageously gas works may be managed when there is a considerable increase in this class of consumption.

The following are the particulars of the working of the several stations:

		Production. Cubic Metres.	Number of Lights.
1. Frankfort-on-the-Oder	1879	1,276,397	15,124
do do	1880	1,309,848	15,255
Increase		35,451	131

By this increase only a part of the decrease of 1879 is recovered; but as the improvement belongs to the second half year, it may be hoped to continue during the present year. Of the land previously acquired with a view to building branch works, a portion was resold at considerable profit.

		Production. Cubic Metres.	Number of Lights.
2. Mülheim-on-the-Rohr	1879	815,870	11,517
do do	1880	906,940	11,832
Increase		91,070	315

A considerable increase has at length followed the extraordinary decreases of the last four years, although the remarkable production of 1875 has not

yet been equalled. The increased consumption is due to the railways and the manufactories.

		Production. Cubic Metres.	Number of Lights.
3. Potsdam-Neuendorf	1879	1,545,004	17,824
do do	1880	1,557,980	18,157
Increase		12,976	333

The increase of production is a matter of loss, the consumption having actually decreased by 7,150 cubic metres, the diminution being therefore repeated for the third year. As, however, there was a slight improvement in the second half year, it is hoped the current year will turn out better. When the change to the metric system was made, there was a thorough revision of discounts, causing considerable loss.

		Production. Cubic Metres.	Number of Lights.
4. Dessau	1879	656,715	10,943
do	1880	717,665	11,258
Increase		60,950	315

The extraordinarily rapid progress of the town of Dessau and its manufactories has again caused a very favorable rise in the consumption of gas. By the same cause as stated in the case of Potsdam, the increase of profit was considerably retarded by lowering the price, and by discounts.

		Production. Cubic Metres.	Number of Lights.
5. Luckenwalde	1879	272,150	3,756
do	1880	301,922	3,957
Increase		29,772	201

The progress of former years has thus been continued at the same rate, although the cloth trade has not yet recovered its normal state of activity.

		Production. Cubic Metres.	Number of Lights.
6. Gladbach-Rheydt	1879	2,534,925	28,860
do do	1880	2,690,950	30,356
Increase		156,025	1,496

The decrease of consumption mentioned in last year's report continued from the end of 1879 to September last, when such a rapid improvement set in, owing to a revival of the cotton trade, that the above large returns were secured, which are only lower than those of 1876. The contract with the Municipality of Gladbach was to have terminated on October 15, 1882. On the 8th to the 12th of October last year a new contract was entered into for the period from October 15, 1882, to the end of the year 1903. With the exception of a small abatement of the price for street lamps, the prices and discounts to private consumers are to remain in force. The Company, however, have to pay to the Municipality, for the use of the subsoil of the streets, a yearly sum rising in defined proportions in a fixed ratio to the local taxes, which have risen enormously in the towns of the Rhine district. The works will, of course, remain the property of the Company at the end of the extended contract period. The highly esteemed chief of the Gladbach establishment, Herr A. Reichardt, who held that position for many years, having been pensioned at his own request, he has been followed in his office by Herr H. Kamlah. Herr Reichardt will be remembered with the greatest esteem by the Company, and by the citizens of Gladbach, Rheydt, and Odenkirchen.

		Production. Cubic Metres.	Number of Lights.
7. Hagen-Herdecke	1879	966,880	11,680
do do	1880	974,770	11,825
Increase		7,890	145

This increase is only a greater loss, the consumption having again decreased as in the previous year, last year's diminution being 15,681 cubic metres. The increase, though small, noticed during the second half year, gives hopes of a better result for the present year, although the iron and steel trade, especially in the export branch, remains depressed.

		Production. Cubic Metres.	Number of Lights.
8. Warsaw-Praga	1879	7,419,374	57,613
do	1880	8,087,391	63,008
Increase		668,017	5,395

This expansion surpassed all previous experience. In consequence, however, of the unusually severe winter, the loss of gas which had been so remarkably diminished in 1879, again increased considerably, so that the actual increase of consumption amounted only to 569,368 cubic meters, or less than the corresponding figures for the preceding year. This is due to depression of trade. The increase in the number of lights is the largest ever recorded, and must be regarded with pleasure as giving evidence that the private consumption is steadily improving. The telescoping of the third gasholder, mentioned in the last report, has been accomplished on the American system, without covering, the cupping being warmed by steam. This arrangement has answered admirably during the past winter, and has caused a great saving of capital. The total gasholder capacity of the Warsaw works is now 28,166 cubic metres; on the 23d of December the production was 43,364 cubic metres, owing principally to bad weather. During the present year six settings of eight retorts, with gas generator furnaces, will be built in retort house No. 3. It has been already mentioned that the average value of the paper currency has somewhat risen, being now 211 as against 206 in 1879. This is still less than two-thirds of the normal rate of exchange for cash payments. The present contract with the city of Warsaw expires on September 26, 1883, the city having waived the right of prolonging it for five years, with a reduction of about 5 per cent. in the selling price of gas. An open circular invitation for the purpose of establishing competing works has had no result. The Municipal President, assisted by Herr Aug. Hegener, a German engineer, contemplates the erection of works by the Municipality, while at the same time treating with the Company for a considerable extension of the contract. The terms offered by the Company are so advantageous to the city of Warsaw that there is the best reason for hoping they will be accepted. It is, moreover, known to the Proprietors that the Company possess at Warsaw the right of carrying on operations for ever, and are therefore able, with calmness, to anticipate eventual competition, especially as nothing is gained by the public lighting. Since the beginning of this year there has been another increase in the Russian import duty on coal, which, as regards the Company, amounted in 1880 to 31,605.23 marks.

		Production. Cubic Metres.	Number of Lights.
9. Erfurt	1879	1,070,943	13,204
do	1880	1,136,489	14,036
Increase		65,546	832

The decrease of the past few years, chiefly the result of the competition of petroleum, which is more active here than anywhere else, has therefore at length yielded to a considerable increase, although the production has not yet recovered the proportions of former years. Erfurt especially affords a confirmation of the statement to be found at the beginning of this report, respecting the generally decreasing severity of petroleum competition. The reduction of price, referred to in the last report, also caused much loss here last year.

		Production. Cubic Metres.	Number of Lights.
10. Krakau-Podgoritza	1879	663,199	6,607
do do	1880	678,741	6,886
Increase		15,542	279

This increase more than compensates for the previous year's decrease. Generator furnaces were also introduced here during the year, two settings of eight retorts having been erected. On account of another fall in the value of silver, the rate of realization was lower here and at Lemberg, being 172½, as against 174 in the previous year.

		Production. Cubic Metres.	Number of Lights.
11. Nordhausen	1879	583,315	8,564
do	1880	615,988	8,968
Increase		32,673	404

In this place also the preceding years' decrease was largely compensated for. The lower prices introduced since July 1, 1879, caused great losses, but, as at Erfurt and Gotha, may have contributed to the increased consumption. Business of all kinds is still unfavorable here; the increase of consumption is almost entirely attributable to the railway station.

		Production. Cubic Metres.	Number of Lights.
12. Lemberg	1879	943,107	11,265
do	1880	997,912	11,655
Increase		54,805	390

The increase much surpassed the decrease of the previous year, although there is not here, more than at Krakau, any considerable amelioration in trade to be recorded. The fall in the rate of exchange has been already referred to in the case of Krakau.

		Production. Cubic Metres.	Number of Lights.
13. Gotha	1879	603,061	8,778
do	1880	625,504	9,002
Increase		22,443	224

This improvement was rather better than the progress recorded in 1879, but did not quite cover the loss caused by the lowering of prices in that year.

		Production. Cubic Metres.	Number of Lights.
14. Ruhrort	1879	434,171	4,298
do	1880	528,746	4,621
Increase		94,575	323

The falling-off in past years is more than covered by this large increase, which is more in proportion than that recorded for any other of the Company's stations. The lessened prices stipulated in the new contract (*vide* last report, given in *Journal* for April 6, 1880, p. 523), and still more the improvement in the iron trade, and the lighting up of the extended harbor with gas, have contributed to this favorable result. On the 17th to the 29th of November last a gas lighting contract was concluded with the neighboring thriving community of Meiderich, on the new Ruhrort model, which promises to become of value in the future.

		Production. Cubic Metres.	Number of Lights.
15. Eupen	1879	275.475	4,002
do	1880	289,141	3,973
Increase		13,666	29

This increase is almost entirely on the losing side; the general state of business in Eupen is still altogether unsatisfactory.

		Production. Cubic Metres.	Number of Lights.
16. Herbesthal	1879	89,168	246
do	1880	90.253	263
Increase		1,085	17

This trifling increase was chiefly owing to a somewhat larger railway consumption.

The following is a statement of the total results of the past year's working:

	Production Cubic Metres.	Number of Lights.
1. Frankfort-on-the-Oder	1,309,848	15,255
2. Mülheim-on-the-Rehr	906,940	11,832
3. Potsdam-Nuendorf	1,557,980	18,157
4. Dessau	717,665	11,258
5. Luckenwalde	301,922	3,957
6. Gladbach-Rheydt	2,690,950	30,356
7. Hagen-Herdecke	974,770	11,825
8. Warsaw-Praga	8,078,391	63,008
9. Erfurt	1,136,489	14,036
10. Krakau-Podgoritza	678,741	6,886
11. Nordhausen	615,988	8,968
12. Lemberg	997,912	11,655
13. Gotha	625,504	9,002
14. Ruhrort	528,746	4,621
15. Eupen	289,141	3,973
16. Herbesthal	90,253	263
Total, 1880	21,510,240	225,052
Total, 1879	20,149,754	214,281
Increase	1,360,486	10,771
	=6.75 p. c.	=5.03 p. c.

The increase of production compared with that of the preceding year has thus risen from 0.57 to 6.75 per cent.; while the increase in consumption has risen from 1.67 to 6.08 per cent. The proportionately small increase in the consumption is explained by the loss of gas in distribution having risen from 4.90 to 5.50 per cent.—a result which was anticipated in the last report as a consequence of the unusually cold winter of 1879–80. It has required great exertion and no small outlay to bring down the percentage of loss from 6.74 in the first to 4.44 in the second half of the year, and thus to obtain for the whole year the respectable average of 5.5 per cent., which is only surpassed by the figures for the year 1879.

The increase in the number of lights has more than doubled, as compared with the previous year, and has only been exceeded in the years 1874–75. The German stations only contributed 60 lights, or 1.12 per cent. of the whole, to the increase of 1879; but last year they added 4707 lights, or 43.7 per cent. of the total. For the first time for three years there was again an increase in the average year'y consumption of every burner in use. This increase amounted to 323.5 cubic metres, or 4.7 cubic metres more in the case of street lamps, and to 82.5 cubic metres, or 2.3 cubic metres each more for private lights; the gross average being 92 cubic metres, or 2.4 cubic metres each more than was consumed in the year 1879.

The consumption of coal was as follows—

	Hectolitres.	Per Cent.
Westphalian	353,683	or 38.63
Upper Silesian	338,444	" 36.96
Moravian	83,647	" 9.14
English	70,067	" 7.65
Lower Silesian	69,311	" 7.57
Platten	422	" 0.05
Total	915,574	100.00

The deviations from the particulars of the previous year's coal consumption are unimportant. The increase in the quantity carbonized amounted to 60,987 hectolitres. The yield of gas from the coal per hectolitre was 23.5 cubic metres, as against 23.6 cubic metres during the previous year.

The average price of coal delivered into the works was 1.37 marks per hectolitre, or 3 pfennige (0.03s.) less than the preceding year's price; thus again touching the minimum cost of coal as in the year 1868. For the beginning of the current year the Company have succeded in buying on the same advantageous terms as in 1880.

The price of coke again rose considerably as compared with the preceding year, the increase amounting to 12 pf. (0.12s.) per hectolitre, thus reaching 87 pf. (0.87s.) per hectolitre, and more than compensating for the diminution in value experienced in 1878.

In the sale of tar there was also an improvement, and the receipts for ammoniacal liquor were larger than the bare increase of quantity produced would account for. The profit on these heads amounted to 104,351.11 marks or 11,778.64 marks more than for the previous year.

The cost of purification was diminished during the year to the insignificant total of 3116.54 marks, and may soon altogether disappear, as at present the spent material is disposed of to chemical manufacturers who make use of the sulphur which it contains.

Last year the amounts usually written off for plant, apparatus, and tools were so much increased that in a few years the items standing under these heads will have entirely disappeared, except in the case of a few of the more valuable articles.

Generator firing has again made satisfactory progress, both as regards extension of construction and economy of coke. Of the gas made, 72 per cent. is produced from settings fired by generator furnaces, as against 64 per cent. so heated during the preceding year. The percentage of coke used as fuel has further diminished from 19.59 to 18.06 kilos. per 100 kilos. of coal carbonized. At Dessau the relative consumption of coke in the generators amounted only to 15.94 kilos., including the fuel required for lighting up and letting down the benches. The value of the economy of fuel which has already been attained, and is still increasing, may be appreciated when it is remembered that in 1880 no more coke was used as fuel than in 1874, although the production of gas for the past year was 25.6 per cent. in excess of that recorded six years since.

The capital expenditure at all the Company's stations was increased by the net amount of 304,805.97 marks during the year. This exceeded the outlay of the previous year by 20,080.22 marks, chiefly in consequence of the erection of a gasholder at Warsaw and the extension of mains at Ruhrort. There are no important extensions in prospect this year; only the generator system will be extended.

The length of mains laid at the end of the year 1880 was 541,132 meters, or 19,519 metres more than at the termination of the previous year.

The gross profit of the undertaking has increased by 161,740.98 marks in spite of abatements in price, on the acceptance of contracts, or on the adoption of the metric system in seven towns, amounting to no less than 68,380 marks; and notwithstanding the unusually large amounts written off the apparatus and tools accounts. The improvement in the Russian exchanges (being so small, and outweighed by a fall in the Austrian exchange) has not affected the profits to any considerable extent. The extra profit is, therefore, to be mainly ascribed to an extended consumption, to technical and economical progress, and to the more advantageous realization of the secondary products, with the somewhat lower cost of coal. The net divisible profit could not, of course, increase in the same ratio, the amortization instalment (63,618.04 marks for 1879), which had in the previous year been covered by the premiums on the last issue of shares, having now to be taken from the business returns, and 73,079.38 marks having been expended on the pension fund on the 25th anniversary of the company. Nevertheless, the balance of the net profits has increased by 13,607.45 marks as compared with 1879, which would enable a dividend of nearly 13½ per cent. to be declared. In accordance with the recommendation of the statutory Audit Committee, the directors have, however, decided to declare a dividend after the rate of 13 per cent. per annum, as for the last three years; and to carry 71,187.63 marks to the reserve fund. It is hoped that the results of the current year's working will enable the directors to increase the reserve by a much greater amount, which would enable them, as mentioned in the last report, to carry

out future extensions to a greater extent from the amounts written off from the reserve fund and from the amortization instalments.

The increase of consumption amounted in January last to 142,605 cubic metres, or more than five times as much as the recorded increase in January, 1880. Prospects are generally favorable if only, as is hoped, peace can be maintained in Europe.

Complying with instructiens given last year, the directors have published a report on the progress of the company during the first 25 years of its incorporation. This will be of special interest not only to the numerous old shareholders, but also to the new proprietors, as it sets forth the reasons of the company's past prosperity, and thereby affords some guidance to a conclusion as to its future existence.

[From the London "Journal of Gas Lighting."]

The Transport of Materials for Gas Works.

ILLUSTRATED BY THE PLANS OF THE YORK, NEWCATSTLE-ON-TYNE, AND BECKTON GAS WORKS.

By V. Wyatt,
Constructing Engineer to the Gas Light and Coke Company.

THIRD ARTICLE.—THE NEWCASTLE AND GATESHEAD GAS WORKS AT REDHEUGH.

The plan which accompanies the present article shows generally the arrangement of these new works and their connections with the external railways, river, and roads. The site altogether is a most desirable one for gas works, and in securing it some years since the gas company displayed more than the usual prescience and boldness belonging to gas enterprises. The entire site gives an area of most valuable land for manufacturing purposes, amounting to about 22 acres. On this site there are already erected two large retort houses, of the improved "stage" type, 240 feet by 90 feet and 240 feet by 95 feet, inside dimensions, capable of carbonizing about 400 tons of coal, and a make of gas of 4 million cubic feet per diem. Around these retort houses there are the necessary gasholders, buildings, structures and plant for the complete equipment and working of a gas factory of the most modern type. There is room still on the ground for four more retort houses of the same character as those already erected; also for two additional gasholders of the largest make, and additional plant and structures equal to a total consumption of 1,200 tons of coal, and a make of gas of twelve million cubic feet per diem for the future requirements of the company.

The position of these works commands the Tanfield and Blaydon branches of the North-Eastern Railway system, forming a triangular piece of ground between the two lines of railway running south and west from Newcastle and Gateshead, with numerous sidings and works for the accommodation of an unlimited amount of traffic. The River Tyne runs along the lower or northern boundary of the property, parallel to the Blaydon branch railway, and under which railway there is an access or roadway to carry the company's low-level line traffic on to the river quay or wharf. Here can be shipped away into and received by the river craft the coke, residual products, and materials forming the river traffic of the gas works. The coals, coke, lime, and other materials, however, are mostly delivered from the railway systems. The point of junction with the North-Eastern Railway system is on the Tanfield branch, the gas company's material being received upon a parallel siding, where the trains of 10-ton and other wagons are broken up into convenient sections, weighed, and taken over the gas company's viaducts direct into the retort houses, and also over the low-level sidings to the other parts of the works.

It will be observed by an inspection of the plan that the coal wagons are drawn up a single-line viaduct from the North-Eastern Railway siding, on an incline of 1 in 50, to an intermediate level piece of viaduct, where the train is brought to a stand. It is then back-shunted or zig-zagged on to either one of four other lines, or branch viaducts, which lead up to and enter the upper level doorways of Nos. 1 and 2 retort houses, up inclines of 1 in 39, 1 in 50, and 1 in 60, and over curves of 200 feet radius. The formation or ground line of the gas works is at high-water level of the River Tyne, and the levels of the upper railways in the retort houses are 22 feet higher than this datum. The stage levels of the retort houses, on which the coal is deposited in front of the retorts, are 8 feet and 9 feet respectively above high water; and the coke holes are exactly at the high-water level of the Tyne.

The low-level lines about the works all run off from the same low-level sidings, adjacent to the North-Eastern Railway, as do the high level lines compassing the works in all directions, into and out of the coke-holes of the two retort houses, and under the North-Eastern Railway branch, on to the wharf of the gas company, alongside the River Tyne. The high and low level lines are thus in direct communication with each other and with the river, the railway system to all parts, and in proximity to the road and highway leading on to the works.

In this example of a gas works we have free communication with railway, river, and road traffic, and an unlimited amount of business can be transacted upon the site. We have here also an example of how a large gas manufacture can be prosecuted on a moderate area of land. When the site is filled up there will be, as before stated, a capacity of manufacture and storage of 12 million cubic feet of gas per diem, on about 22 acres of land, including the quay area recovered from the Tyne; equal to about 1¾ acres of land to a make per diem of a million cubic feet of gas.

Upon these works there are no covered coal stores beyond what is afforded by the roomy stages in front of the retort benches, which afford room for 6,000 tons of coal, being 15 days' full consumption in the two retort houses already built. The railway communications to the several collieries in the Newcastle district are so direct, proximate, and convenient, that the coal comes in daily, on the shortest possible notice, and fresh hewn from the pits. In fact, the retort houses themselves stand over the coal measures of the Newcastle and Durham coal fields; hence the small amount of haulage necessary, and the unlimited coal area from which to draw the supplies, render the situation a most exceptional, economical, and desirable one in all respects for the works of a gas company. The coal delivered into the retort houses costs only 6s. 3d. per ton, all included. The same economical results follow with the delivery of lime and other materials used about gas works; and the coke, sulphate of ammonia, etc., are exported by the railway as well as by dock routes to all parts of the world.

The viaducts upon these works are single-line viaducts, and are arranged with openings or bays of 20 feet, carried upon cast iron columns 1 foot in diameter, the superstructure being composed of wrought iron main girders placed at 12-feet centres, with wrought iron rolled joists for the cross girders. On the cross girders, which are placed at 5-feet centers, are laid and secured the wooden longitudinal timbers, carrying the T-rails of 60 lbs. weight per lineal yard of single rail. This weight of rail is about the minimum of weight that should be used on the viaduct and other railway lines where the locomotive is used for haulage purposes. The locomotive used at these works has a cylinder 9 inches in diameter with a stroke of 18 inches, and weighs, with fuel and water, 11½ tons. The wheel base is 5 feet, and it is capable of traversing curves as sharp as 50 feet radius. The long train of 10-ton trucks, as brought on to the site from the North-Eastern Railway, is broken up into convenient sections to suit the small locomotive, and taken up the inclined viaducts direct to the retort houses, and placed in front of the retorts as wanted. The viaducts are so arranged that they can be used for the purpose of coal storage in the "open," whenever required—as at the Beckton works. This has not been done up to the present time, as the use of the fresh coal from the adjacent coal fields forms an important economical item of the Redheugh works.

[To be Continued.]

Improved Street Lighting by Gas at Westminster.

The question of improved gas lighting is receiving further attention at the hands of The Gaslight and Coke Company, who have completed the arrangements for a piece of experimental lighting on an extensive scale.

In the present instance the site selected is the thoroughfare from Palace Yard, Westminster, to Trafalgar Square, including Parliament street, Whitehall and Charing Cross. There are 78 lamps in all, which, with the exception of two, are to be fitted on the existing standards, the two extra lamps being those on a refuge in front of the Home Office. Of these 78 lamps, 63 are of 60-candle illuminating power, and are distributed along the sides of the roadway; 10 are of 180 candle power, and are those placed on the various refuges; one is of 200 candle power, and is in front of the statue of Charles I. at Charing Cross; the remaining four being of 100 candle power, and placed around the statue itself.

The lamps are composed of Sugg's combination flat-flame burners, those of 60-candle power having four, those of 180-candle power having five, and those of 200-candle power having six burners in a group. The burners are enclosed in Sugg's patent lanterns, of special shape and ornamental appearance, glazed with clear glass, and having porcelain reflectors fitted in the upper portion. By this means the light is well distributed around and thrown down, there being no shadow cast under the lantern. The lantern is surrounded by a ventilating arrangement ornamental in character. The lamps are at present lighted by means of a flash-jet, but they are shortly to be lighted in the ordinary way, by means of a torch. It is proposed to extinguish a certain proportion of the lamps each night after the rising of the House.

The present experiment is intended to demonstrate the practicability of lighting streets in a thoroughly efficient manner with gas, with but a small comparative increase of cost upon the ordinary system of street lighting, and it is intended to continue it for three months. It is estimated that the abso-

lute extra cost of the gas in the new system will only be 6s. per hour for the entire lighting, or a little over 1d. per lamp per hour. The lanterns are bronzed and are otherwise finished off in a manner befitting the locality. The public have had an opportunity of seeing some of the lamps in use lately, and of judging of their excellent effect; but the entire series will be lighted probably to-morrow evening for the first time. The arrangements have been carried out by Mr. T. C. Hersee, the chief inspector of The Gaslight and Coke Company, in collaboration with Mr. W. Sugg, of Vincent Works, Westminster.

The latter gentleman has submitted a proposal to Her Majesty's Government to illuminate Trafalgar Square on the same principle, and is awaiting their permission; that of the St. Martin's Vestry has been given for the portion of the square in which they are immediately interested. The series will consist of 48 lamps, 40 being of 60-candle power, and eight of 180-candle power, the latter being on the refuges. The total increase in the cost of gas for the whole series is estimated at 2s. per hour.—*Review of Gas and Water Engineering.*

[Abstract of a Paper read before the Society of Engineers on Monday, March 7th, 1881.]

Gas Engines.

By Mr. C. Gandon, Assoc. M. Inst. C.E.

The Second Ordinary Meeting of the Society of Engineers for the present year was held on the 7th of March, when a paper on "Gas Engines" was read by Mr. C. Gandon, Engineer of the Crystal Palace District Gas Company.

The paper pointed out that the use of coal gas as a motive power is of comparatively recent origin, and that this is not a matter for surprise, seeing that its introduction for lighting purposes dates only from the commencement of the present century. As early as the year 1794 a patent was taken out in England for producing an inflammable vapor-force by exploding vapors of spirits of tar or turpentine in closed vessels; and between that date and 1860 various other inventions were patented for obtaining motive power by the explosion of various mixtures, gaseous and solid. But although carburetted hydrogen is mentioned by some, it appears that the idea of utilizing coal gas, as made for lighting purposes, for working steam engines was only first practically introduced in the "Lenoir" gas engine, patented in 1860, and first introduced into this country at the Exhibition of 1862. A general description of the Lenoir engine was given, and it was pointed out that among the drawbacks to its use was the damage done to its working parts by the sudden and violent nature of the explosions, and also the necessity for the use of electricity for the explosion of the charges of gas and air with which it was worked. In more modern gas engines the necessity for electricity has been avoided by the employment of jets of gas for igniting the charges; two jets being required, as the one in contact with the charge is extinguished by the explosion, and the other permanent jet serves to relight it.

The "Otto and Langen" gas engine was then described. In this the effects of the sudden explosions are avoided by utilizing, in the first instance, the force of the explosions to compress the air on one side of the piston; and this compressed air, during the return stroke of the piston, is made to communicate motion to the working parts of the engine. The chief improvement, however, which has been made in the construction and working of gas engines is due to the compression before ignition of the charges of mixed gas and air, by means of which a larger proportion of air can be used than would form an explosive mixture at ordinary atmospheric pressures; and the force thus developed is gradual and continuous, instead of sudden, and a consequent economy in the gas consumption and convenience in working is obtained.

Several gas engines constructed on these principles were described in the paper, among which the "Otto" silent gas engine appeared to the author to be one of the most successful. Its general principles were described and illustrated by diagrams, and it was stated that its consumption of gas is at the rate of about 21 cubic feet per horse power per hour. These engines are comparatively noiseless in working; their parts few and simple; and beyond cleaning, they require little or no attention.

It was further pointed out that on account of the heat generated by the explosions it is necessary that the cylinders of gas engines should be jacketed and surrounded by water, and that advantage had been taken of this in one engine called the "Eclipse," in which the water, instead of being allowed to escape when heated, is stored in a separate chamber, by which steam is generated from it, and this steam is used as an auxilliary to the gas for working the engine.

Attention was also drawn to the "Bischopp" gas engine, chiefly on account of the small sizes in which it is made, ranging from one-half man or one-eighth horse power upwards. This engine, although not comparatively economical in its consumption of gas, is remarkable for its simplicity and small size, by reason of which it is available for purposes for which it would otherwise be impossible to apply mechanical power.

The author, referring to comparisons which have been made between the cost of working gas and steam engines, observed that the practice has generally been to take the total cost of working in each case, including labor; and that when this is done the comparisons are invariably in favor of gas engines. But it is to be observed that such estimates are not reliable. A gas engine requires little or no attendance, and the results of the comparisons would depend mainly upon the amount estimated for this in the case of the steam engine with which it is compared. For a small engine, it would in most cases be unfair to estimate the whole time of one attendant, while, as the size increases, the proportionate cost of attendance would diminish; but with a gas engine there is very little variation.

Instances were given where estimates have been made in this manner showing steam engines to be from two to seven times more expensive in working than gas engines, although when the fuel alone is regarded the gas engine is in all cases the more expensive. Such estimates were, the author said, doubtless made with every care, and might be true for particular cases, but they proved that it was impossible to frame a comparison which would be generally true.

Examining the cost of the fuel alone, it was shown that gas must necessarily, both in theory and practice, be more costly than solid fuel, but that when the cost of labor, wear and tear, and first cost are also considered, the conclusion arrived at by the author is that for engines of small sizes gas will in all cases be the more economical, and that, even with larger engines, if the same economy cannot be always maintained, circumstances will, in many cases, render gas engines the most advantageous and convenient, particularly where the intermittent use of an engine is required.—*Journal of Gas Lighting.*

Luminous Paint

The Journal of the *Society of Arts* states that the manufacturers having succeeded in reducing the cost of production of this paint, its use is, in consequence, becoming largely extended.

"One of the more important of recent applications of this material is for the white-washing of ceilings. When the paint was first made, it was proposed to utilize it in this manner, but one difficulty in doing so was the high cost of the material, and the second was that it could only be applied with a varnish, and not in the ordinary manner of a lime wash. There seems, however, now to be no difficulty in this application, and several small rooms have been successfully treated.

"Mr. Spottiswoode, the President of the Royal Society, has had the ceilings of some rooms in his house covered with this paint, and at the company's offices in Aldermanbury there is also a room with a luminous ceiling. The effect is better than might have been anticipated. The room appears as if it were lighted with bright moonlight, except that no portion of it is brighter than the rest, as is, of course, with moonlight, where the rays of the moon actually fall.

"Even on coming into such a room out of the daylight there is no difficulty in seeing sufficiently well to walk about the room, take papers or objects, etc., from the table, and after a few minutes the eyes become sufficiently accustomed to the light to be able, at all events, to see the time by an ordinary watch face.

"Another novel application is to portable lanterns, if such an expression can be used. These are being formed of oblong tin cases, the outside of them being coated with the paint. Upon hot water being poured into the inside, the luminosity of the paint is excited to a very high degree. It is well known to those who have experimented with the material that on lighting a surface covered with it by magnesium wire or other powerful illuminator, the great brilliance which immediately results dies down in a very short time, leaving a comparatively dimly-lighted surface. The heat of the water brings out the same amount of brilliancy, and keeps it at its maximum as long as the water remains hot.

"If only a little water be placed at the bottom of the tin, the luminosity may be aroused by shaking the tin, so as to warm all sides of it. As it dies down another shake brings it up again. This form appears much better than the ordinary plan of having a sheet of the stuff covered with a glass and set in a frame like that of a picture.

"These appear to be the principal applications besides those noticed in Mr. Heaton's paper above referred to. The paint is also used to a considerable extent for coating match-boxes, statues, brackets, etc., but such objects as these can only be included in the class of interesting scientific toys."

Blue Ink.—Take six drachms pure Prussian blue and one drachm oxalic acid. Grind in a mortar with a little water until they form a perfectly smooth paste. Dissolve a sufficient quantity of this paste in water to give the proper tint.

The Diffusibility of Carbolic Acid.

One day last December the people of Newark, New Jersey, were greatly annoyed by a taste of carbolic acid in the city water, supplied from the Passaic River. The matter was investigated, and the contamination was traced to a paper mill ten or twelve miles up the river, where an incredibly small amount of carbolic acid had been allowed to get into the water. If the report of Mr. Geo. Shepard Page is correct, the occurrence will furnish a new illustration of the wonderful divisibility of matter, and the extreme delicacy of the sense of taste. Mr. Page says, in a letter to the *Tribune:*

"The paper mill of the Messrs. Kingsland is located on the Third River (a stream of considerable magnitude) two miles from where it empties into the Passaic. From the latter point to the pumping station of the Newark Water Works is also two miles. The volume of water in the Third River is not less than two millions of gallons per day, and in the Passaic 150 millions gallons per day. The Messrs. Kingsland, among other specialities, carbolize paper by immersion in a bath of the best liquid carbolic acid of a quality such as is used in medicinal preparations. In the process of manufacture there is a small percentage of waste paper. No paper has been carbolized since last June, when not over a hundred pounds of waste or torn paper were placed in the loft of the mill, where it remained until the last of December. It is well known to chemists and many intelligent persons that carbolic acid (really an alcohol and not an acid) evaporates rapidly when exposed to the air. To the sense of smell there was no evidence of carbolic acid in this waste paper when the Messrs. Kingsland decided, in December, to work it up again. Dust having accumulated upon it, washing in the mill pond was necessary.

"A few days after this a perceptible taste of carbolic acid was noticed by the people of Newark, not only in the drinking water, but also in tea and coffee made with boiling water. As an absolute fact, not over ten pounds (a gallon) of carbolic acid had been used in this paper when treated. Certainly 30 per cent. had evaporated, leaving not over seven pounds to permeate 300,000,000 gallons of water, a portion of which was aerated by passing over rapids and dams, through four miles of river, seven miles of pipe, and countless taps. It would seem incredible had we not the evidence of chemists and medical men in Newark perfectly familiar with the peculiar taste of carbolic acid.

"Pardon me the space occupied by this narrative, but so remarkable a scientific fact deserves to be recorded. Of course no injurious effects would be experienced, as a single carbolic troche would contain more acid than a thousand gallons of Passaic water. Indeed, a beneficial effect should be felt (of course, to a limited extent), in neutralizing Paterson and Passaic sewage, below which cities Newark and Jersey City obtain most of their water supply."—*Sci. Am.*

Suffocation by Gas

The following account of a case of death resulting from suffocation caused by the inhalation of illuminating gas is taken from the Brooklyn *Daily Eagle*, of April 19th:

"Coroner Keller takes exception to the criticisms which were made on his action in the case of the girl, Matilda A. Hogfeldt, who was found dead at No. 276 Sackett street, on Saturday morning. He states that he made a careful investigation, and that death resulted, as the jury found, from suffocation from escaping gas. The girl had only been in the employment of Mrs. Winne, the occupant of the house, for four or five days previous to her death. She slept in the front hall bedroom on the top floor, in which there was the usual gas fixture. Mrs. Winne had frequently instructed her servants to use candles and not gas in their rooms, but no direct order was given to the deceased to that effect, Mrs. Winne supposing that she would follow the custom of the other domestics in that respect. From the evidence taken at the inquest it appears that about 6:30 o'clock on Saturday morning Frank Winne, aged 17 years, went downstairs as usual for his breakfast, and was surprised to find that Matilda was not up. He then went to her room to call her, but he found the door locked on the inside and receiving no response to his loud knocking went down stairs and notified his mother. After a brief delay a key was found which opened the door of the girl's room. Mrs. Winne and her son found the gas burning brightly, and the poor girl lying on the floor with her face downward. She was still dressed, nothing being removed with the exception of her shoes and stockings. She was stiff, but her face was still warm. The odor of gas was so strong that Mrs. Winne and her son had to retreat from the room. The latter, by the direction of his mother, went for a policeman and in a few minutes returned with officer Ferry of the Third Precinct. Before the arrival of the latter, Mr. A. G. Spier, of No. 289 Sackett street, had reached the house and finding the room filled with gas, turned down the light and opened the window which had been tightly closed. Doctors were summoned, but the unfortunate girl had long been beyond all human aid, having been, as they pronounced, dead for several hours. Coroner Keller was notified in the forenoon and at once went to the house, impaneled a jury and held the inquest. With the jury he visited the room and found by examination of the pipes where the leak had been. It was at the joint of the gas fixture leading to the second gas jet, which had not been lighted. The Coroner then took the statements of Frank Winne, Mrs. Winne, officer Ferry, and Mr. Spier, and the jury, after a brief deliberation, found that death resulted from suffocation from the inhaling of gas. The jury hesitated some time in bringing in a verdict, some of them thinking that some one should be censured, but no action to that effect was taken.

"The gas which caused the death of the girl was that supplied by the Citizens' Gas Company, who use the water gas of the Fulton Municipal Company. This gas is said to be extremely dangerous, and it is alleged that many persons have been killed by it since it came into use in this city and New York. It is said that it possesses a large percentage of insidious poison, and the death of this girl is pointed to as a proof of this fact. A further investigation of the case will probably be made by the Health authorities, who have had their attention directed to it."

The facts herein stated agree substantially with a critical review of the testimony which was taken before Coroner Keller at the time of holding the inquest, a copy of the same having been kindly furnished us by that official.

A Swedish Girl Suffocated by Gas.—Sophia Svensen, forty years old, a Swedish servant employed at No. 200 West Fifty-sixth street, was found dead in bed yesterday morning, having been suffocated during the night by escaped gas. She had probably blown out the gas. Her death is believed to have been purely accidental.—New York *World*, April 23.

The Fitful Kerosene.

A special despatch to the New York *Daily Herald*, of April 20th, by way of Albuberque, New Mexico, states that San Marcial, on the Atchison, Topeka and Santa Fe Railroad, in New Mexico, was destroyed by fire on that date. In less than half an hour the town was in ashes, and all this damage was caused by the upsetting of a kerosene lamp.

It would seem to be about time that some stringent measures were enacted with regard to the sale of adulterated kerosene. If the subject cannot be dealt with thoroughly and completely by the legislatures of the different States, it is high time that the National Legislature was appealed to for aid in this direction. There is every disposition evinced by the average legislator to hamper and restrict the gas maker, but he pays no heed whatever to the illegitimate and murderous traffic which is carried on in the adulteration and sale of the lighter oils of petroleum.

The Petroleum Outlook.

The situation in the producing field, so far as it affords a basis for anything like an accurate estimate of production, is extremely unsatisfactory. A committee of producers have, within the past two months, undertaken to give to the public reliable estimates of current production, by taking the stocks at a given number of wells.

In doing this they assume that the production may be fairly estimated by taking those stocks in connection with the daily runs and shipments of the pipe lines. While the results of this method are at present the best at our command, for estimating the production, they are nevertheless quite uncertain, and may be quite delusive. Because as the whole number of wells are not embraced in the stock so taken, it may be that a large reduction of stocks has taken place at the wells where stocks have not been so taken. If this is the case, and we are rather inclined to think it is, then the committee's reported stocks cannot convey a fair average of decrease or increase for the month, as the case may be.

The committee's report just received, giving a statement of those stocks at wells for the month of March, as compared with the report of the preceding month, shows a decrease of stock at wells of 142,500 bbls. To offset this somewhat, the addition to stock in private iron tanks for the past month as compared with the preceding one is 31,000 bbls.

The committee's last report is based upon reports from 5,434 wells. Inasmuch as there are about 9,500 wells in the Bradford region, it will readily be seen what opportunity there is for drawing largely from the stocks of those wells whose stocks are not reported; and if such a draft occurred, how delusive would be an estimate based upon the reports from those wells whose stocks were actually reported.

The increase in stock in pipe lines for the month was 1,109,286 bbls. This amount it was expected would be decreased by the decrease of stocks at the wells, and we are inclined to believe that if an accurate account of all the stocks at all the wells could be obtained such a decrease would be shown

But treat the figures and report as we may, there can be no doubt that we are still producing too much oil, and in the activity which comes from the opening of the spring, we may look for a continuation of this excess for some time to come.

We look, however, with some confidence for a greatly increased demand for the export trade, and when this occurs it may, and probably will go a great way towards sustaining, and perhaps stimulating, prices for the crude, and creating and maintaining a considerable speculative feeling.—*Stowell's Petroleum Reporter.*

Awards for Public Lighting in the City of New York.

Mayor Grace, Comptroller Campbell and Commissioner of Public Works, Thompson, the City's Gas Commission, have made the following awards for lighting the public lamps for one year from May 1 :

New York Gas Light Company—All the lamps south of Grand street, at $17.50 ; Manhattan Gas Light Company—All the lamps between Grand street and Thirty-fourth street, at $17.50 per lamp ; Metropolitan Gas Light Company—Part of the lamps between Thirty-fourth and Seventy-ninth streets, at $17.50 a lamp ; Mutual Gas Light Company—Part of the lamps between 34th and 79th streets, and the lamps in the public parks between Grand and 34th streets, at $17.50 a lamp ; Harlem Gas Light Company—Lamps between 79th street and the Harlem River at $19.50 a lamp ; Central Gas Light Company—All the lamps in the Twenty-third Ward, at $29 a lamp ; Northern Gas Light Company—A part of the lamps in the Twenty-fourth Ward, at $32 a lamp ; Yonkers Gas Light Company—Lamps in the Twenty-fourth Ward, at $30 each.—New York *World*, April 29th.

Correspondence

[The JOURNAL is not responsible for the opinions expressed by correspondents.]

Old Practices and New Theories in Retort Heating.

The method of firing retort benches is well known, but the theory of combustion has not been so generally understood, or else but little attention was given to it until the necessity to make cheaper gas became imperative, by reason of the various systems of lighting by kerosene—and, latterly, by electricity—being so much improved as to become dangerous rivals, unless the process of gas making would also be improved.

While purifying, scrubbing, and all other machinery connected with the manufacture of gas, outside the retort house, were greatly improved, principally by the enterprise and rivalry of manufacturers of gas apparatus—not by the gas manufacturers themselves—the "retort house, where the dividends are made," was let alone, with the exception of substituting clay for iron retorts, a few self-sealing retort lids, and other improvements, which, however, were all suggested by "Father Clegg," when the gas industry was still in its infancy.

If we compare the relative progress of steam, railroad, electric and sanitary engineering with that of gas manufacture, the result is not favorable to our branch of the profession of engineering. In every record of proceedings of associations of gas men we find contradictions and conflicting views on subjects about which there ought now to be no longer any doubt. We find, for instance, that at one gas works a certain appliance entirely prevented stopped pipes ; whereas, at another, working under the same conditions—as near as can be found out—the remedy which was a sure thing in the former would not do anything at the latter works.

Now, although it is true in medicine that "one man's meat is another man's poison," and for very good reasons too, such reasoning cannot be admitted in any branch of engineering ; for, in this profession, we have to travel a perfectly straight road, and one of the guide posts on this road (metaphorically speaking) informs us that "like causes produce like results." When, therefore, we read that in one place different results were obtained than were at another, all working under the same conditions too, then we must mistrust some of the information offered to us ; and unless we are able to try the thing (whatever it be) ourselves, we never will know which is right or which wrong.

This state of things cannot be found in any other branch of engineering : Doctors of Medicine and Doctors of Theology only differ in their mutual views. Doctors of Law are all agreed on the main point—to get their client's money ; but any difference in the opinion of engineers cannot exist for any length of time, because facts, and not opinions, are the groundwork of our temple. All this, however, has nothing to do with the proper firing of retort benches, and we will, therefore, return to our subject.

Briefly, we find, on examining the old methods of heating retorts, the same old furnaces used now as were used many years ago—excepting, of course the regenerator system, but which is an improvement of a recent date.

We find a narrow, deep, furnace, in which the fuel is piled up to a depth of from 12″ to 15″, in fact, they are regular carbonic oxide generators for most of the time. Nearly half of the coke used in their furnaces is wasted, and in this manner :

We will suppose a bench to be hot, and the fireman having just performed that hardest part of his labor, cleaning a fire—himself in nearly the position of a doubled up jack knife—called on in that unhandy position to do this work, which requires a man's full power, fills up the furnace with coke as evenly as he can, and as high as the furnace door frame will let him (12″ to 14″). During the cleaning a great deal of heat is lost, and by the time this deep layer of coke has fairly ignited, by means of the little hot coke left when the fire was cleaned, more heat is lost. Now, we ought to get the benefit of the fuel put into the furnace, but we do not—why ? Because of the depth of the fuel through which the air admitted between the grate bars must pass, we are making carbonic oxide, and this product of incomplete combustion which, in the generator furnace, is utilized most effectively, in our old furnaces passes out of the chimney flues, and is there seen issuing as a tall, fierce flame. The air which it ought to have in the furnace it does not get until it is where it can no longer do any good. This process of carbonic oxide making continues until the fuel has been naturally reduced to that thickness when the air admitted between the grate bars and the fuel remaining in the furnace have approached that well-balanced condition which makes complete combustion in the furnace itself possible.

Now, we get real effective heat for a little while ; for, the furnace being narrow, the little coke left is soon consumed, the fire is re-filled in the same manner as before, and we again go through the same process. During that period, when complete combustion takes place in the furnace, very little, if any, flame will be seen issuing from the chimney flue, it is then when the bench is the hottest. But when the fire is nicely cleaned, with a full, deep supply of coke, the waste of fuel may be seen easy enough. Sometimes this flame continually issuing out of the chimney flues, is thought to indicate hot benches, experience teaches otherwise. The foregoing has been the practice at all the works with which the writer has been connected, among which were two of the largest in America, and, although the errors herein stated were repeatedly pointed out by him, he was powerless to apply the remedy. Though this subject is worthy of more attention and elucidation, the foregoing recapitulation must suffice for the present ; but we must not stop here, for having pointed out an error—which is sometimes easy—let us also at least suggest a remedy.

In the first place, then, we have the regenerative systems. The gentlemen who invented and brought into practical shape the several designs of regenerative furnaces deserve our praise, and this, perhaps, no one who is conversant with the subject will deny them. The furnaces have been repeatedly described. Like in our own old over-charged furnaces carbonic oxide is made—but continually—and instead of being allowed to escape more air is admitted, by suitable arrangements, and the gases are thus completely consumed, thus certainly effecting a saving of fuel. Whether this saving will balance the additional cost of the furnace, seems as yet to be not positively decided ; but there is one especial feature which these furnaces have to recommend them to the serious attention of all gas companies, namely, the fact that with their aid it is comparatively easy to keep good heats in a retort house, which will thus make any company more independent of strikes and strikers. Drawing and charging are easy when we have good heats, and quickly learned ; but to keep the heats up is a very different matter.

There is another and a simple way by which good results may be obtained, and there is really no good reason why it should not at least be tried. This is the plan—

Make the furnaces instead, of 12″ and 14″ wide, 28″ and 32″ wide. Then instead of piling the fuel up 15″ deep, the same amount of fuel which is now thrown into the furnace will make a layer 6″ to 8″ deep, and complete combustion will take place within the furnace not at the chimney top. No fuel will be wasted, and that used will be all effective ; then, we must either use less fuel or get more effect out of the same amount of it. Furthermore, there is no need of the large useless space we now have in our retort ovens. Many arches now holding only five or six retorts could well accommodate eight and ten retorts. Make the retorts a little smaller, the charges lighter and more frequent, and it will be found to the great pecuniary advantage of those who will boldly advance and not stick to the old *good enough* system of twenty years ago.

The 12,000 cubic feet per ton will be reached before long depend on it—until then let us all give "a long pull, a strong pull and a pull, all together."

Yours, truly,

NORFOLK, VA., April 21st, 1881. FREDERIC EGNER.

PETROLEUM SHIPMENTS FOR MARCH.—The shipments of crude oil from the producing regions in Pennsylvania during the month of March amounted to 1,276,483 bbls ; 681,322 bbls. were shipped to New York.

THE AMERICAN GAS-LIGHT JOURNAL AND CHEMICAL REPERTORY

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MONDAY, MAY 2, 1881.

Official Report of Examinations of Gas for three Weeks ending April 23, 1881, made at the Photometrical Room of the Department of Public Works.

Corrected Illuminating Power.

1881. April	Time of Day at which Test were made.	New York Gas Light Co.	Manhattan Gas-Light Co.	Mutual Gas-Light Co.	Metropolitan Gas-Light Co.	Harlem Gas-Light Co.	Municipal Gas-Light Co.
		†	*	†	‡	*	†
4		24.95	19.54	30.18	22.37	18.32	30.45
5	Between	23.41	19.15	28.88	22.59	17.85	30.56
6	9.30 A.M.	26.79	19.70	28.39	22.38	17.41	30.42
7	and	27.22	19.74	26.24	22.83	18.22	30.10
8	1 P. M.	24.94	19.63	28.00	23.16	18.49	30.59
9		25.20	20.46	27.40	24.31	18.90	30.22
	Average	25.42	19.70	28.18	22.94	18.20	30.39
11		26.92	19.90	27.29	24.07	19.30	31.08
12		26.54	20.12	27.95	23.82	19.70	30.63
13		27.88	19.32	27.71	23.36	19.72	31.71
14		27.49	19.24	27.15	23.78	19.59	31.17
15		27.28	19.79	28.09	24.02	19.76	31.00
16		26.58	20.10	27.88	23.93	19.68	30.89
	Average	27.11	19.74	27.68	23.82	19.62	31.08
18		24.48	19.92	27.51	23.90	19.99	30.80
19		26.54	20.41	27.37	22.95	19.82	31.04
20		26.25	21.54	27.73	23.92	20.39	31.01
21		27.13	21.03	28.03	24.16	19.15	32.08
22		26.41	21.36	27.41	23.65	19.09	32.84
23		26.91	21.46	27.54	23.86	19.28	31.27
	Average	26.28	20.95	27.60	23.74	19.62	31.51

* Five foot lava tip with check.
† Bray's slit union, No. 7.
‡ Bray's slit union, No. 6.

E. G. LOVE, Gas Examiner.

[From "Sanitary Engineer."]

Notes on the Electric Light.

By HENRY MORTON, Ph.D.,
President of Stevens Institute of Technology.

The plan of electric lighting described in *Harper's Weekly* for April 16, as carried out in England by a Mr. Swan, has nothing whatever new about it, as compared with the experiments of Maxim, Edison, and others. Indeed, these experimenters have gone far beyond Mr. Swan in the efficiency and economy of their lights. If Mr. Swan should be able to sustain his claims to priority in certain experiments with carbon filaments inclosed in exhausted vessels, it may be of considerable importance as affecting the value of some patents; but as regards the practical development of the subject, he has simply followed at some distance what has been done on this side of the water.

I notice in the papers that the Brush Electric Light Company have offered to put up and maintain in New York a large number of lights of 2,000-candle power each, "French measurement." As the lights so far in operation do not come anywhere near 2,000-candle power, I was curious to find out what "French measurement" signified; and, on inquiry, learned on good authority that it meant multiplying the actual light in its most favorable condition by four.

To call such a proceeding as this "French measurement" seems to me a very unwarrantable libel on the honesty and intelligence of that nation.

The reason given for this multiplication was almost too absurd for belief; but it was in fact as follows:

The electric light, it was said gave a certain illumination, say of 500 candles in front, behind, also to the right, and again to the left; therefore, it was argued, it gave four times 500, or 2,000-candle power.

Now it did not seem to occur to the person who originated this brilliant idea that just the same was true of a candle or any other light.

A candle gives out light of one candle power in front, behind, to the right, and to the left, and therefore on this "French measurement" should be reckoned as 4 candle power. Indeed, the candle has much better right to such multiplication, for it gives out a light at least uniform in all directions, and does not skip about, now throwing most of its light in one direction, and now in another.

The correct measurement and statement of candle power in all sorts of lights is the same, and is based on the manifestly correct understanding that a light of 2 or 20 or 500 or 2,000 candle power is a light which gives out in all directions combined twice or 20 times or 500 times or 2,000 times as much light as a well-made spermaceti candle burning two grains a minute.

Of course, if an electric or any other light gives out 500 times as much light as a candle in each and every direction, its total light is 500 times as great as that of the candle, and no more. We might just as well multiply an electric light by 360, because there are 360 degrees in a circle, and each degree represents a direction in which its light is 500 times as great as that of a candle in the same direction.

The electric light has enough to contend with to secure popular favor without being discredited by false and absurd claims. If the Broadway lights are credited with being 2,000 candles, we shall presently have one of Siemens' new gas burners put beside them to prove that 600 candles with gas is more luminous than 2,000 with electricity, which it would then be very easy to demonstrate.

The Coal Fields of Arizona.

Of the extent and character of the recently discovered coal fields in Arizona, the *Journal* says:

"The valley on Deer Creek is about 10 or 12 miles long, and forms a natural basin. Last Wednesday George Martin and George Cook in prospecting found croppings, shale and ledge matter, which cover almost the entire surface of from 800 to 1,000 acres of land. The ledges in several places crop out, with a dip of 20° to the southeast. From breaks in the surface of the land and a washout where the water has cut through, it is evident that one of the ledges is at least 90 feet thick. The others will have to be prospected before the owners can determine their extent.

"It is certainly a wonderful discovery of magnificent coal beds. The discoverers brought some fine samples to town, which were tested yesterday in a blacksmith shop, and they burned beautifully. It is bituminous coal of a superior character, specially adapted to railroading or machinery of any kind. In the last few days persons have gone thither, and are prospecting the valley in search of coal. Many locations have already been made.

"These coal fields are about 18 miles from the San Pedro valley, and can be reached by a road going up Deer Creek valley. The line of the projected railroad from Globe to Tombstone is right along that valley. Messrs. Martin, Cook, Coats, Wicks and others have taken up two sections of 160 acres each, and propose to commence operations in connection with the same at an early date."—*Mining and Scientific Press.*

Failure of Electric Lighting in Bristol, England.

Anent this progress of electric lighting, we note that the Bristol authorities, who have recently been experimenting with the electric light in the central thoroughfares of that city, have come to the conclusion that matters are not yet ripe enough to warrant their continuing these experiments, and the result is that the lamps, which have been erected at considerable expense to the ratepayers, are being taken down.

This decision has been arrived at, we believe, by the Sanitary Committee, who have had charge of the work, after due consideration of the merits of the light employed, and in view of the extensive experiments to be made in London under other systems; whilst the frequent improvements made in electric lighting, and the most recent methods or patents brought forward—amongst others, we suppose, the lamp invented by Mr. George Lane Fox and Mr. Swan—have doubtless had considerable influence upon them. Meanwhile, "doomed gas" continues to hold its position.—*Gas Engineer.*

Extinction of Gas Lamps.

H. Harthan, Superintendent of the Selma (Ala.) Gas Light Company, writes us that on the night of April 18th the city lamps, which are lighted by gas supplied by his company, were suddenly, and without any apparent cause, extinguished.

The cause has since been traced to an atmospheric disturbance similar to that experienced in Newark, Jersey City, New York, and Brooklyn, on the evening of April 16, 1880.

Quinia from Coal Tar.

The New York *Commercial Bulletin* notices a report current in that city, that a Liberty street firm had applied for a patent for a process to manufacture quinia from coal tar.

It is stated that the firm has been interested with a chemist to accomplish this result for several years, and that the efforts have been crowned with success. In the "Chemical Notes" published in this *Journal* during the past year, the readers have been kept informed of the results obtained by Skraup, Koenigs, Hesse, and others, in their endeavor to determine the exact composition of the cinchona alkaloids, which, when once known, will doubtless lead to their synthetical production. Whether such a result is so near being accomplished as the rumor mentioned above indicates, remains to be seen. But of the im

portance of the synthetical production of quinia there can be no doubt, when it is remembered that in 1879 $2,000,000 worth of cinchona bark was imported, most of which has doubtless been used in the manufacture of this indispensable alkaloid.—*Am. Journal of Pharmacy.*

Filtration by Spongy Iron.

Messrs. Easton and Anderson are testing the value of spongy iron upon a large scale in the filters of the water works at Antwerp. The water is first allowed to pass through a mixture of iron and gravel covered with sand. The experimental results have been more satisfactory than those from ordinary filters, and there are no indications of any necessity for renewing the iron, which serves to oxidize the organic matters suspended in the water.—*Ann. des Ponts et Chauss.*

Lighting Waterloo Bridge.—Mr. Wm. Sugg has addressed a letter to the Metropolitan Board of Works, requesting, in the event of the Board not continuing their contract for electric lighting on Waterloo Bridge, that he may be allowed to submit a plan for lighting the Bridge with gas by means of his patent gas burners and wind-proof ventilating lanterns.—*Metropolitan.*

Gas Stocks.

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May 2, 1881.

☞ All communciations will receive particular attention
☞ The following quotations are based on the par value of $100 per share.

	Capital.	Par.	Bid.	Asked
Gas Co.'s of N. Y. City.				
Central	$466,000	50	60	65
Harlem	1,800,000	50	68	73
" Bonds	170,000			103
Manhattan	4,000,000	50	176	180x
Metropolitan	2,500,000	100	136	138
" Scrip	1,000,000	...	102	103
Mutual	5,000,000	100	65	68
" Bonds, go'd.	900,000	1000	100	104
Municipal	1,500,000	100	150	155
" Bonds	750,000		106	110
New York	4,000,000	100	90	93
Northern	270,000	50	—	100
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	110	115
Citizens	1,200,000	20	45	50
" S. F. Bonds.	320,000	1000	100	105
Fulton Municipal	1,500,000	100	55	60
Peoples	1,000,000	10	25	30
" Bonds	290,000	.	101	104
" "	250,000	...	70	75
Metropolitan	1,000,000	100	55	60
Nassau	1,000,000	25	45	48
" Ctfs.	700,000	1000	95	100
Williamsburgh	1,000,000	50	60	64
" Bonds		...	98	103
Kings Co	135,000	100	55	60
" Bonds	40,000	—	—	—
Richmond Co., S. I.	300,000	...	70	75
Out of Town Gas Companies.				
Buffalo Mutual, N.Y	750,000	100	72	76
" Bonds	200,000	1000	95	100
Citizens, Newark	918,000	50	85	90
" " Bds.	124,000	—	105	10
Chicago Gas Co., Ills			125	—
Cincinnati G. & C. Co.			178	180
Consolidated, Balt.			71	72
Bonds			107	—
East Boston, Mass		25	114	120
Hannibal, Mo	100,000	100	95	100
Hartford, Conn	700,000	25	140	144
Halifax N. S	400,000	40	148	150
Hamilton, Ontario	150.000	40	117½	
Jersey City	750,000	20	140	150
Jacksonville, Ill	120,000	50	100	...
Lewistown Maine	400,000	100	—	100
Laclede St Louis Mo.	1,200,000	100	108	110
Montreal, Canada	2,000,000	100	153	154
New Haven, Conn		25	132	—
Oakland, Cal			32	33
Peoples, Jersey City		...	95	100
" " Bds.				5
Pittsfield, Mass			120	130
Rochester, N. Y.		50	70	80
" Citizens		100	30	35
Woonsocket, R. I.	150,000	100	80	...
Wilmington, Del.		50	174	...
Yonkers		50	30	32
Rondout & Kingston			75	80
St. Louis Missouri	600 000	50	250	254
San Francisco Gas-Co., S. Fr'isco Cal.			70	71
Toledo, Ohio			95	97
Troy, Citizens	600,000	100	—	—
Washington, D. C.	1,500,000	20	130	200
" Scrip	500,000	20	150	160

Manhattan declared a dividend of 7%, payable on demand.

30 shares Manhattan, sold at auction, at 176 3 4; 13 shares at 177; 50 Metropolitan at 137 1-2.

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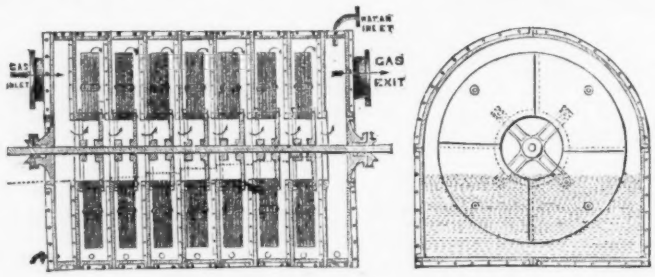

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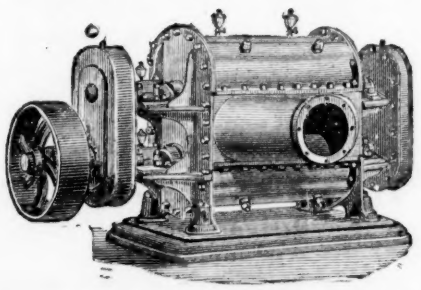

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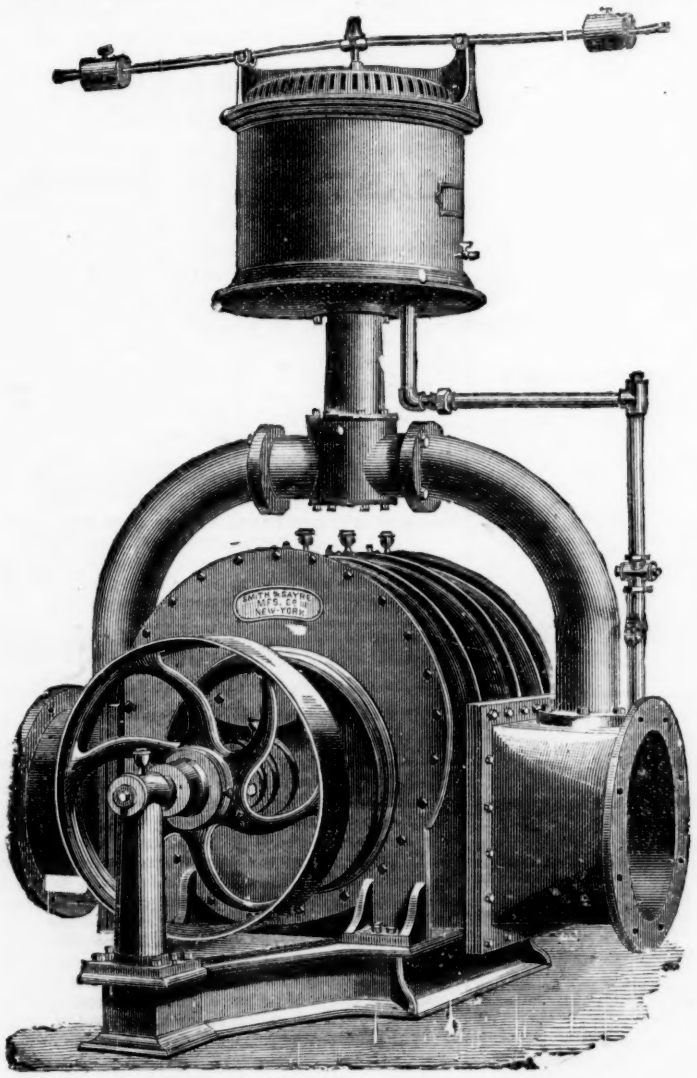

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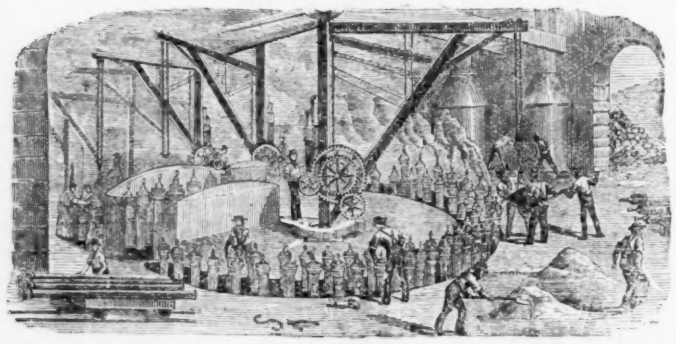

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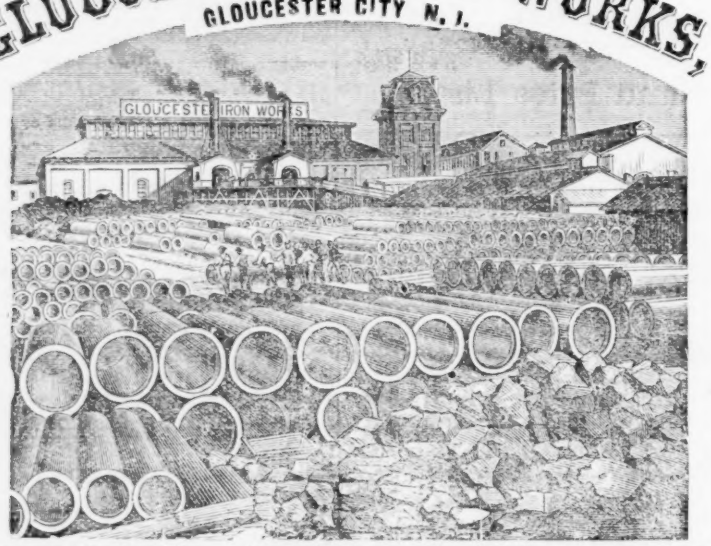

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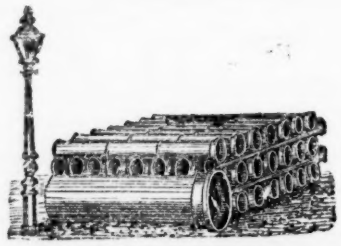

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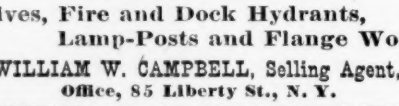

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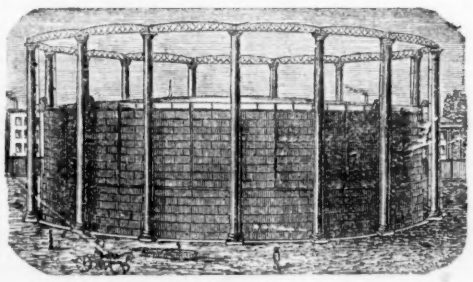

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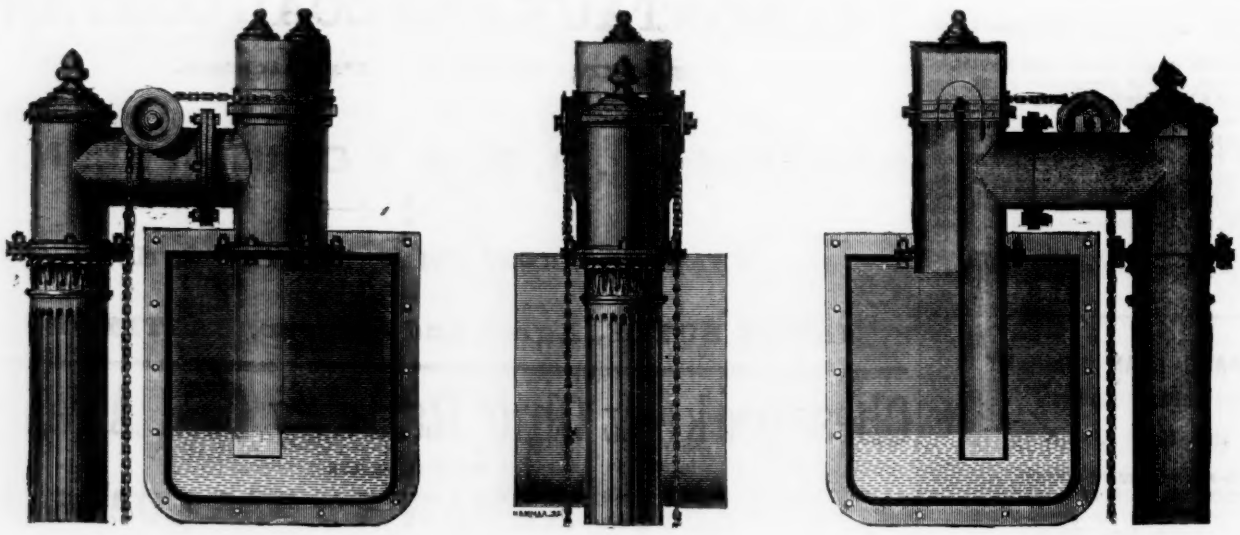

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